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**Zijlstra**

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(45) **Date of Patent: Aug. 25, 2009**

(54) **PLUG WITH SLIDABLE PINS AND BLOCKING DEVICE**

(76) Inventor: **Eduard Mathieu Antonius Zijlstra**, 60 Benzenraderweg, Heerlen (NL) 6417 ST

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(2), (4) Date: **Jan. 3, 2008**

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(51) **Int. Cl.**
***H01R 13/44*** (2006.01)

(52) **U.S. Cl.** ..... **439/131**

(58) **Field of Classification Search** ..... 439/131, 439/133, 171–174

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,626,052 A * 12/1986 Rumble ..... 439/173
5,159,545 A * 10/1992 Lee ..... 363/146
5,423,690 A * 6/1995 Selker et al. ..... 439/172
5,791,921 A 8/1998 Lee
6,025,486 A * 2/2000 Mistry et al. ..... 540/122
6,062,884 A * 5/2000 Messimer et al. ..... 439/172
6,190,184 B1 * 2/2001 Cimbal et al. ..... 439/131
6,382,996 B1 * 5/2002 Eyman ..... 439/172
6,923,666 B1 * 8/2005 Liao ..... 439/172
7,052,298 B1 * 5/2006 Cheng ..... 439/171

FOREIGN PATENT DOCUMENTS

WO WO-02/063723 8/2002

OTHER PUBLICATIONS

International Search Report for PCT/NL2006/000337.

* cited by examiner

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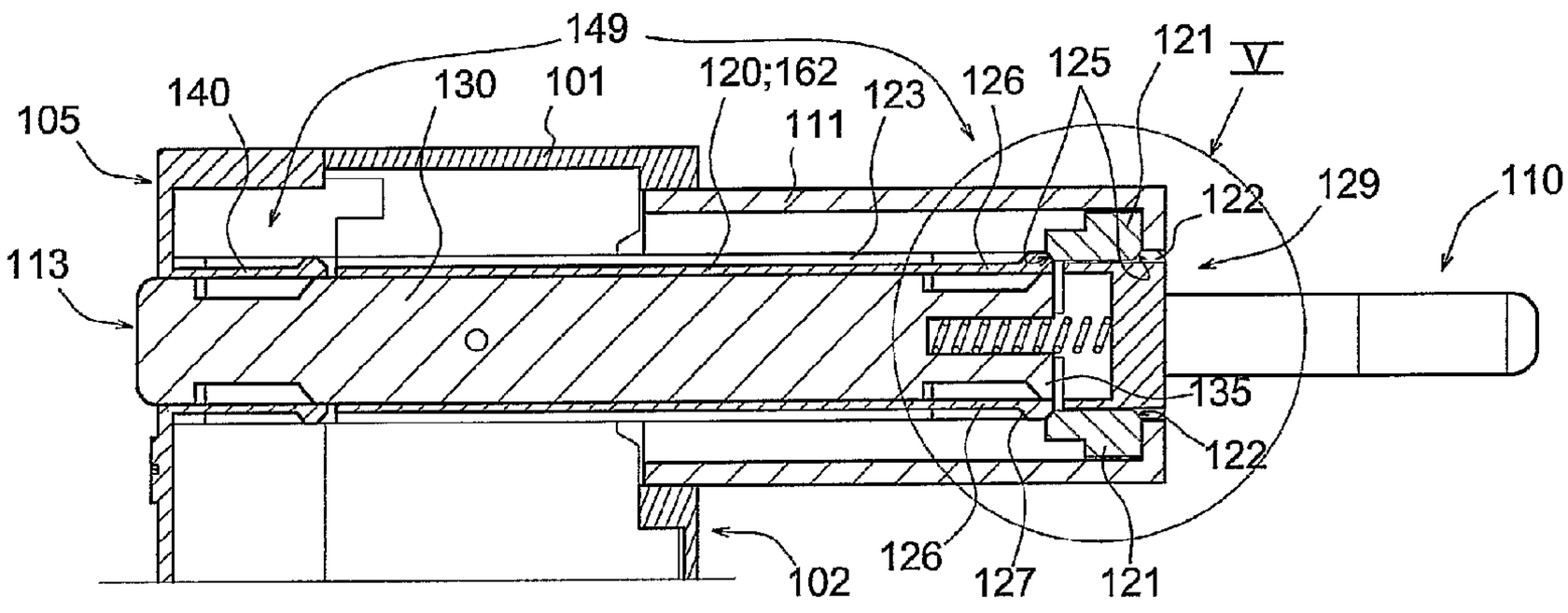
(74) *Attorney, Agent, or Firm*—Foley Hoag LLP

(57) **ABSTRACT**

Plug, comprising a housing with a first contact face, a first set of pins for a first type of power point, and a first blocking device, comprising interacting first and second blocking means, in which the first set of pins is slidably accommodated in the housing. The first set of pins in the active position projects from the first contact face of the housing in such a way that said set of pins can be inserted into the first type of power point. The first blocking means are connected to the first set of pins. The second blocking means are connected to the housing. The first and second blocking means are movable relative to each other, so that they can assume a blocking position and an unblocking position.

The first blocking device furthermore comprises a first stopper, which first stopper is movable between a stop position, in which the movability of the first and second blocking means relative to each other is prevented, and a release position.

**10 Claims, 13 Drawing Sheets**



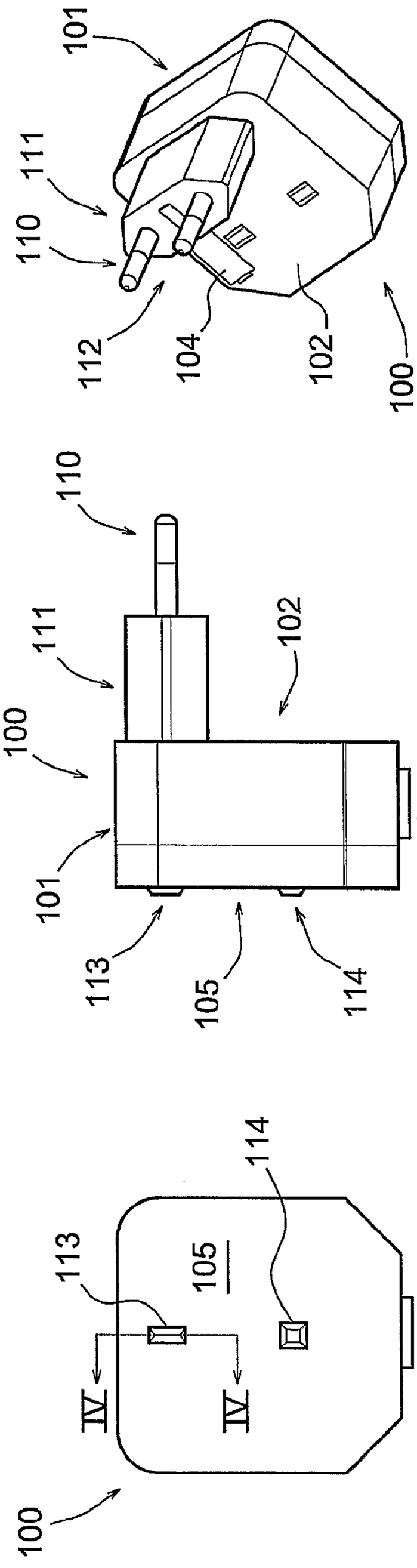



FIG. 1

FIG. 2

FIG. 3

FIG. 4

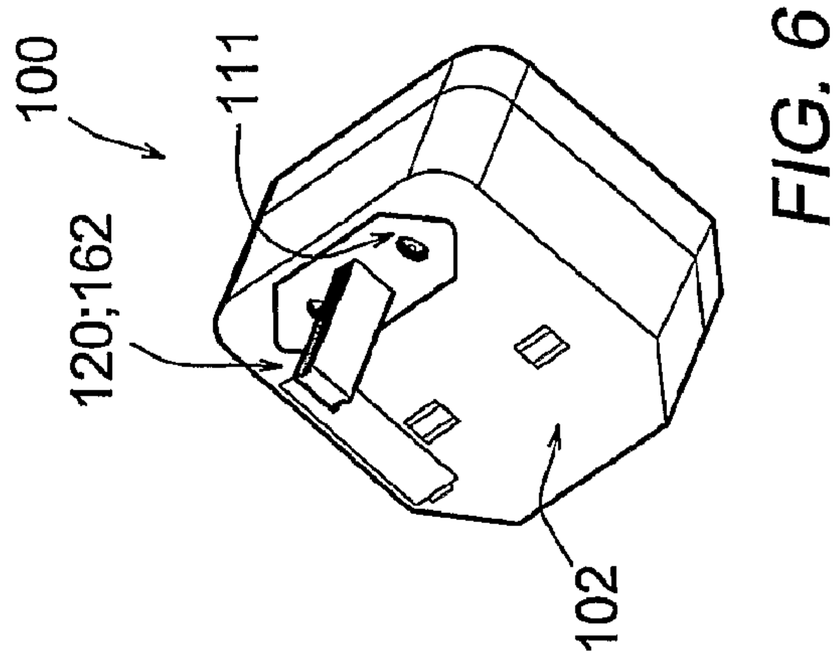



FIG. 6

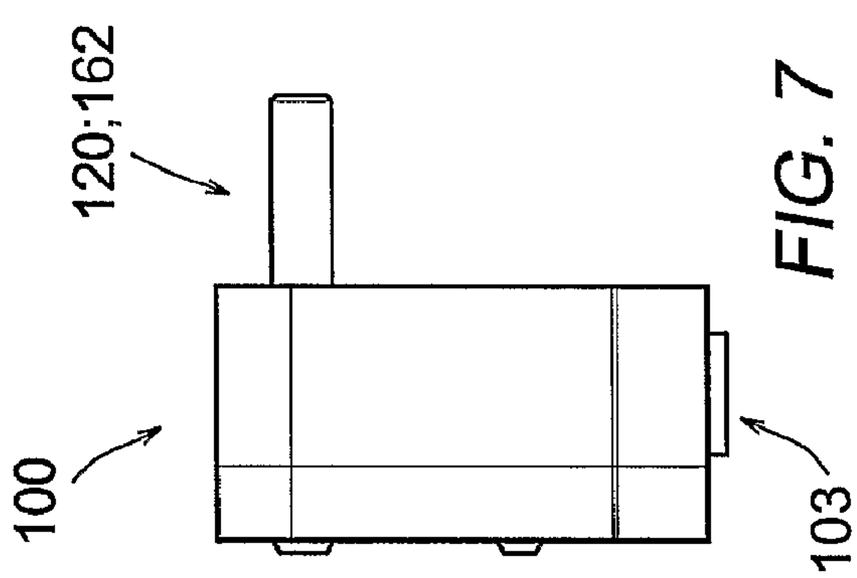



FIG. 7

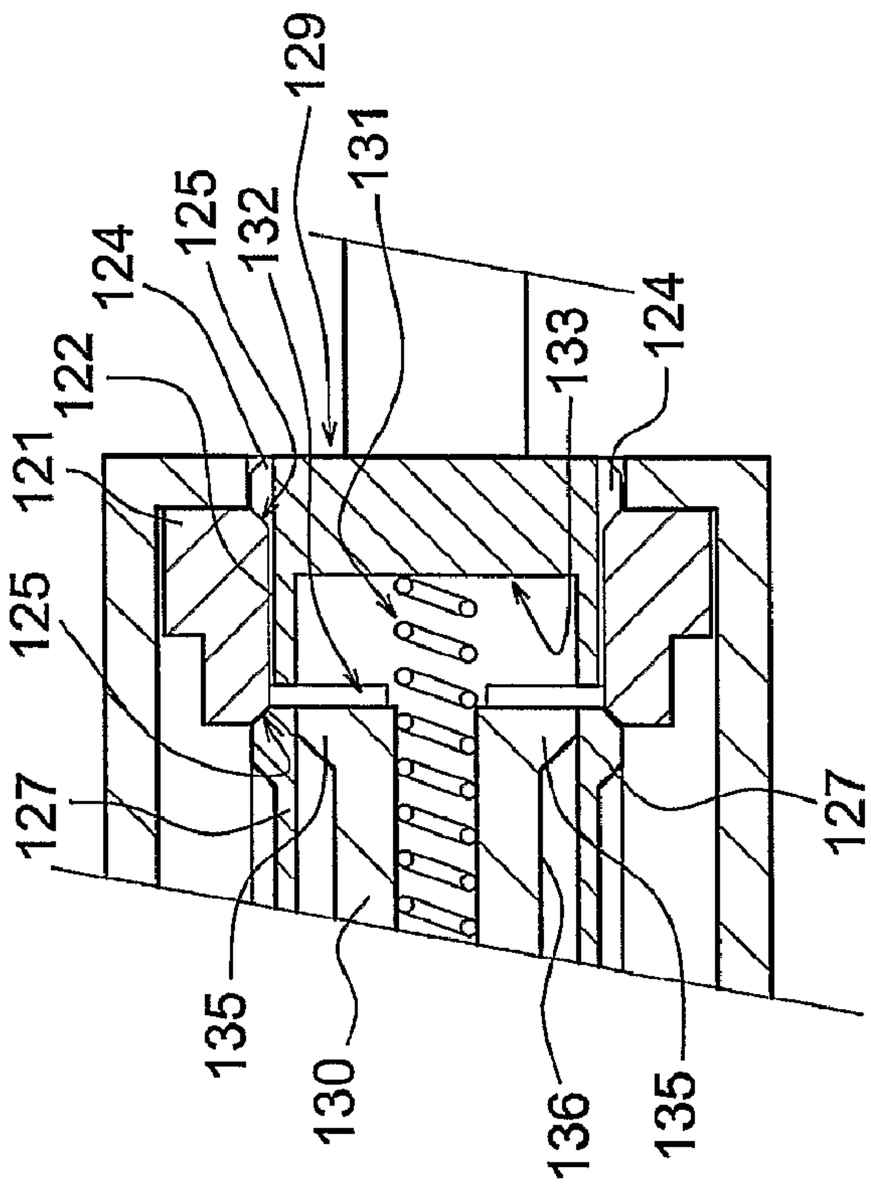



FIG. 5

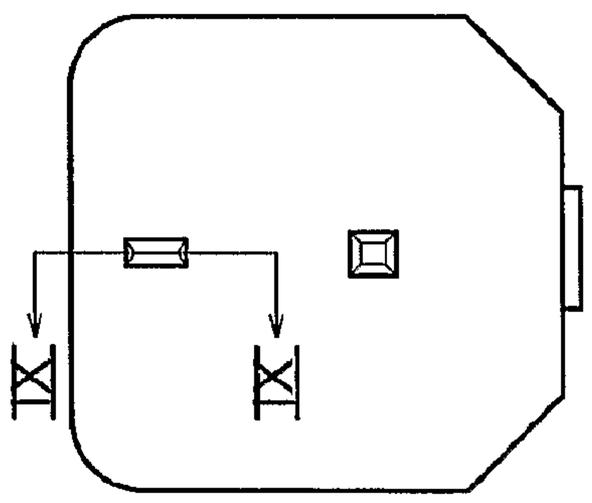



FIG. 8

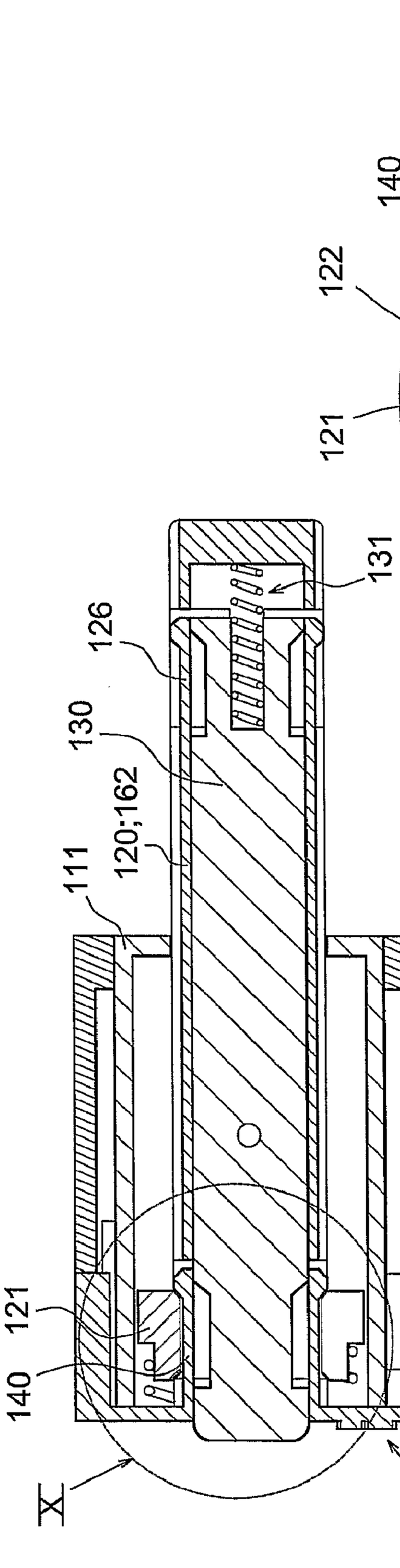

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FIG. 9

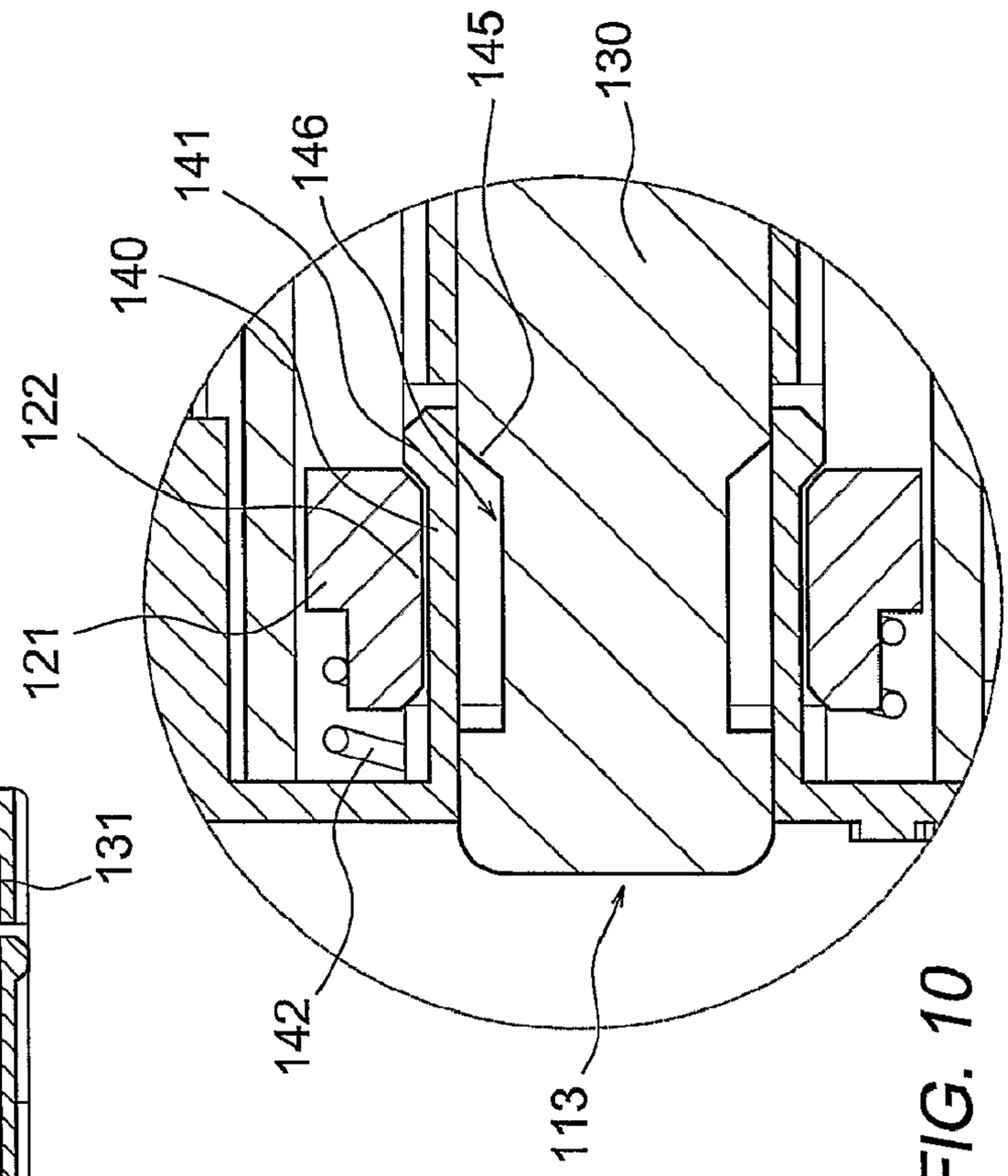
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FIG. 10

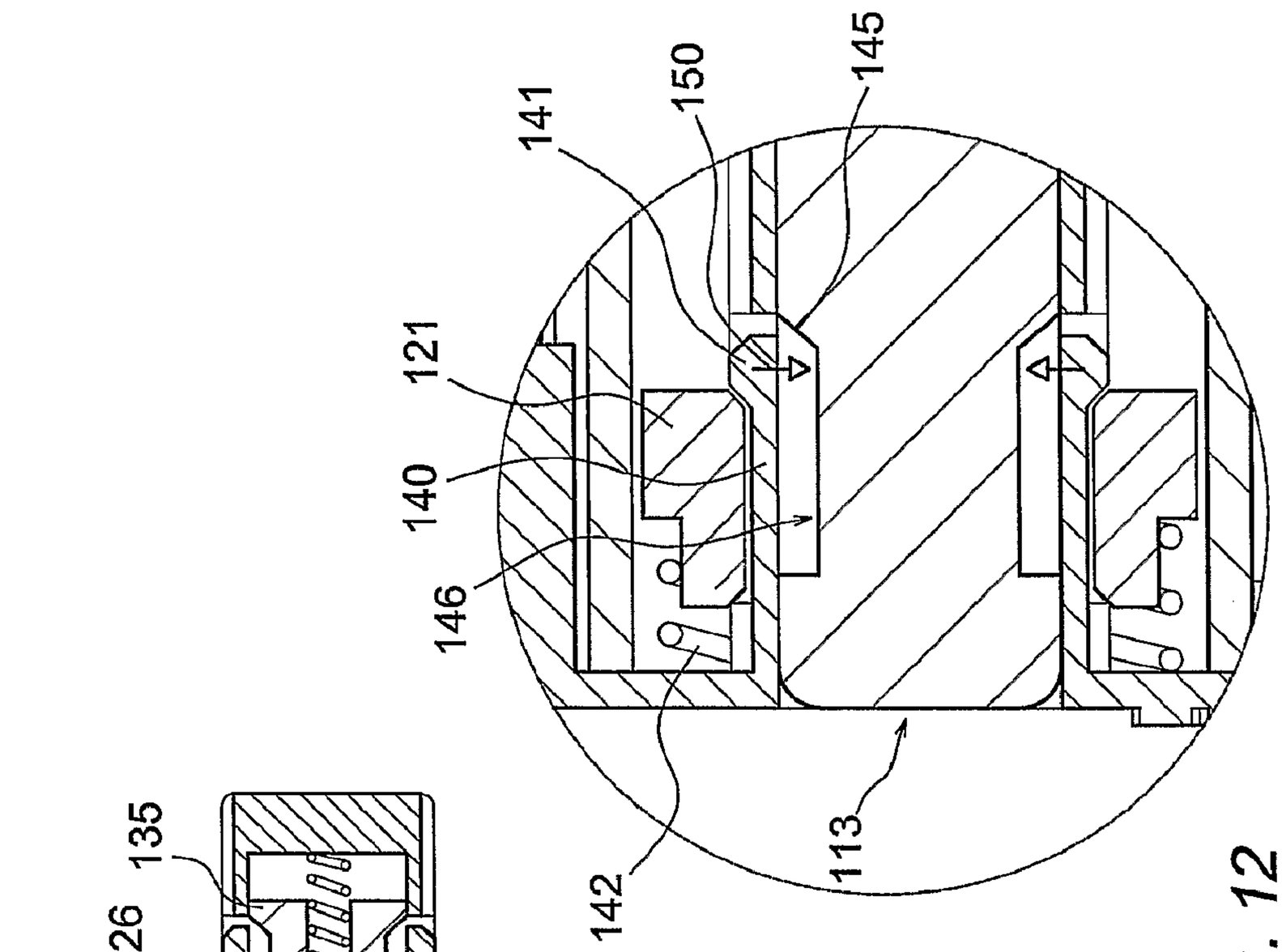
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FIG. 12

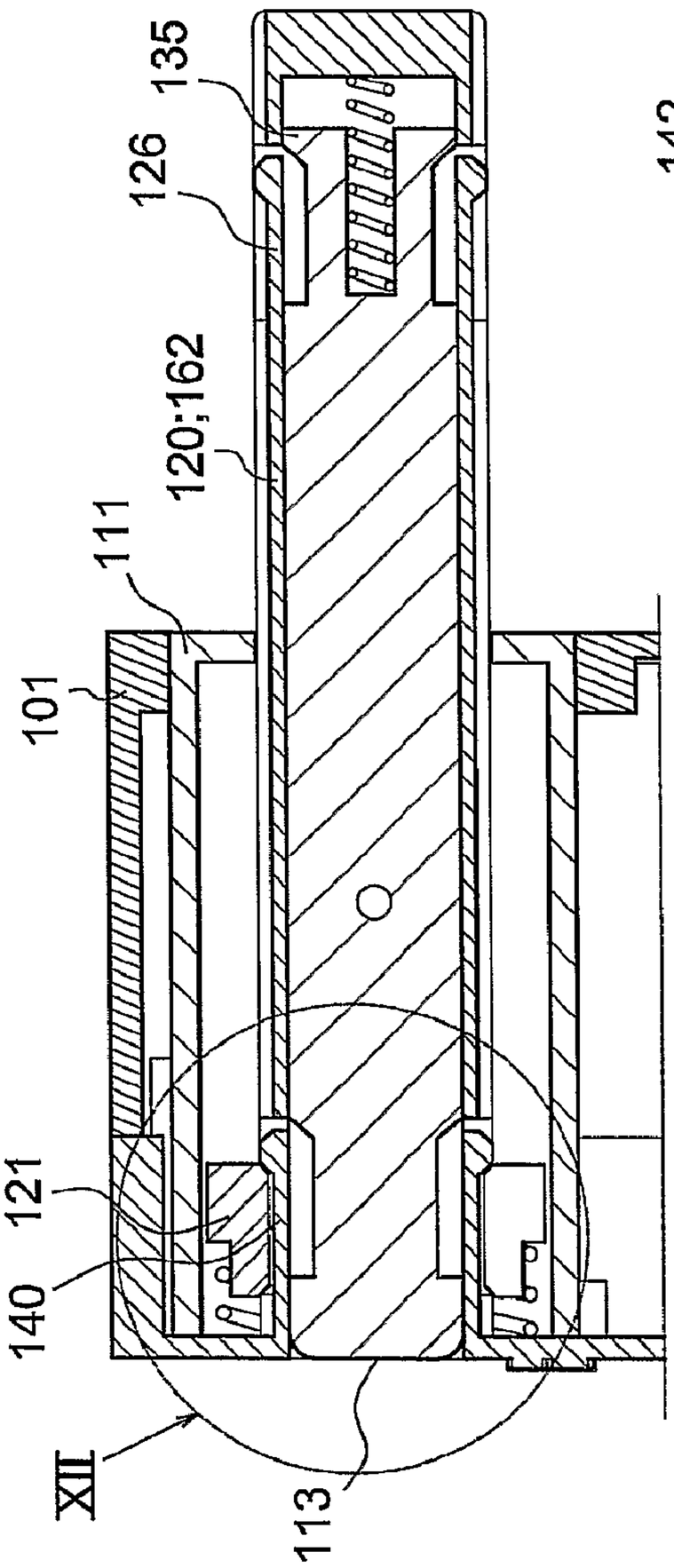
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FIG. 11

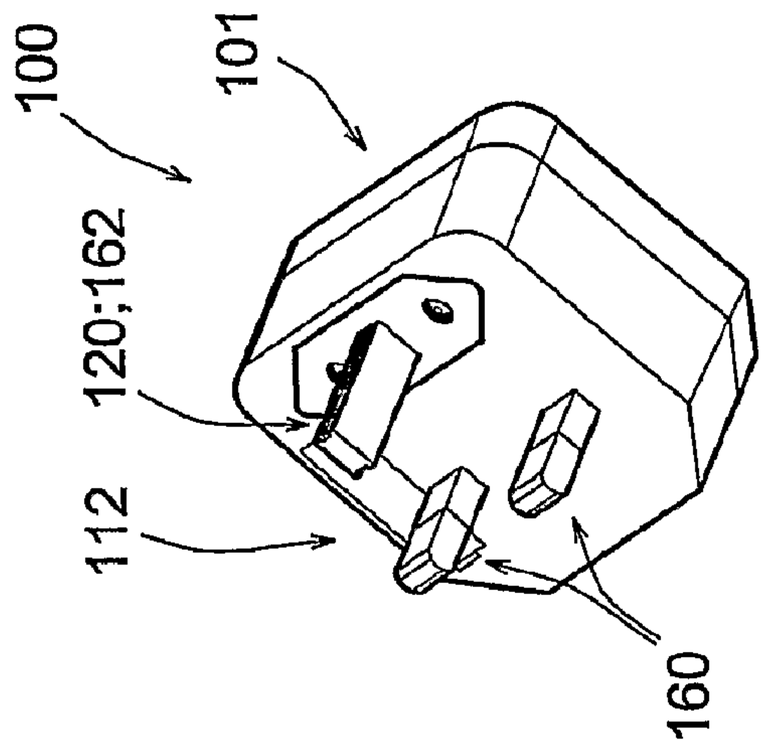


FIG. 13

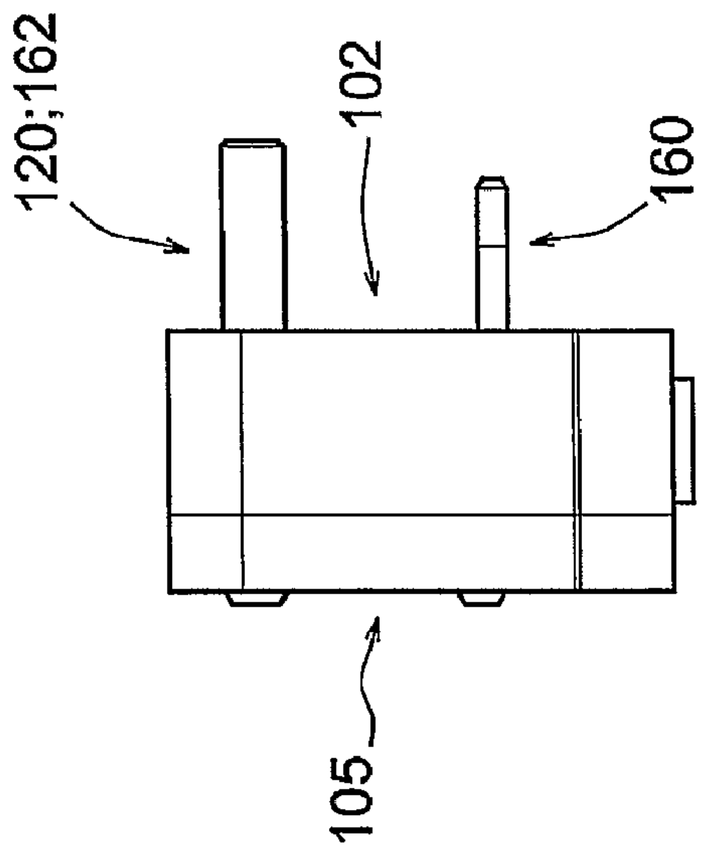


FIG. 14

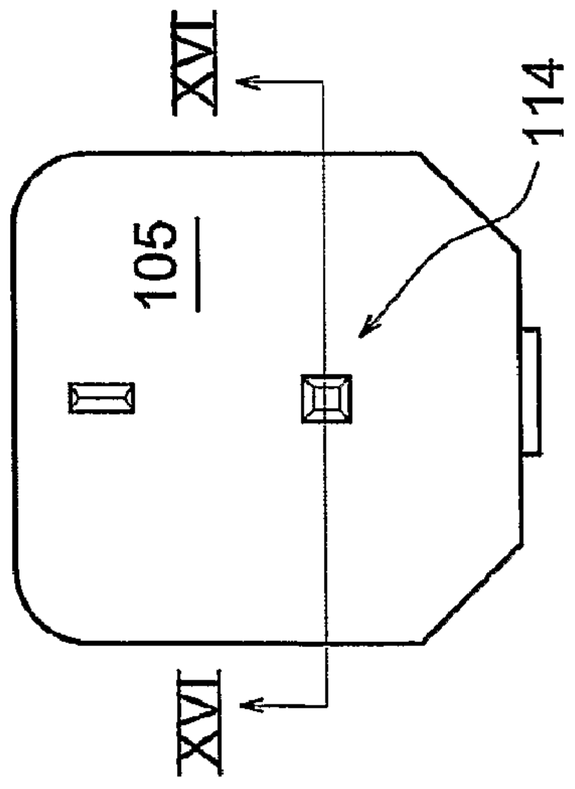


FIG. 15

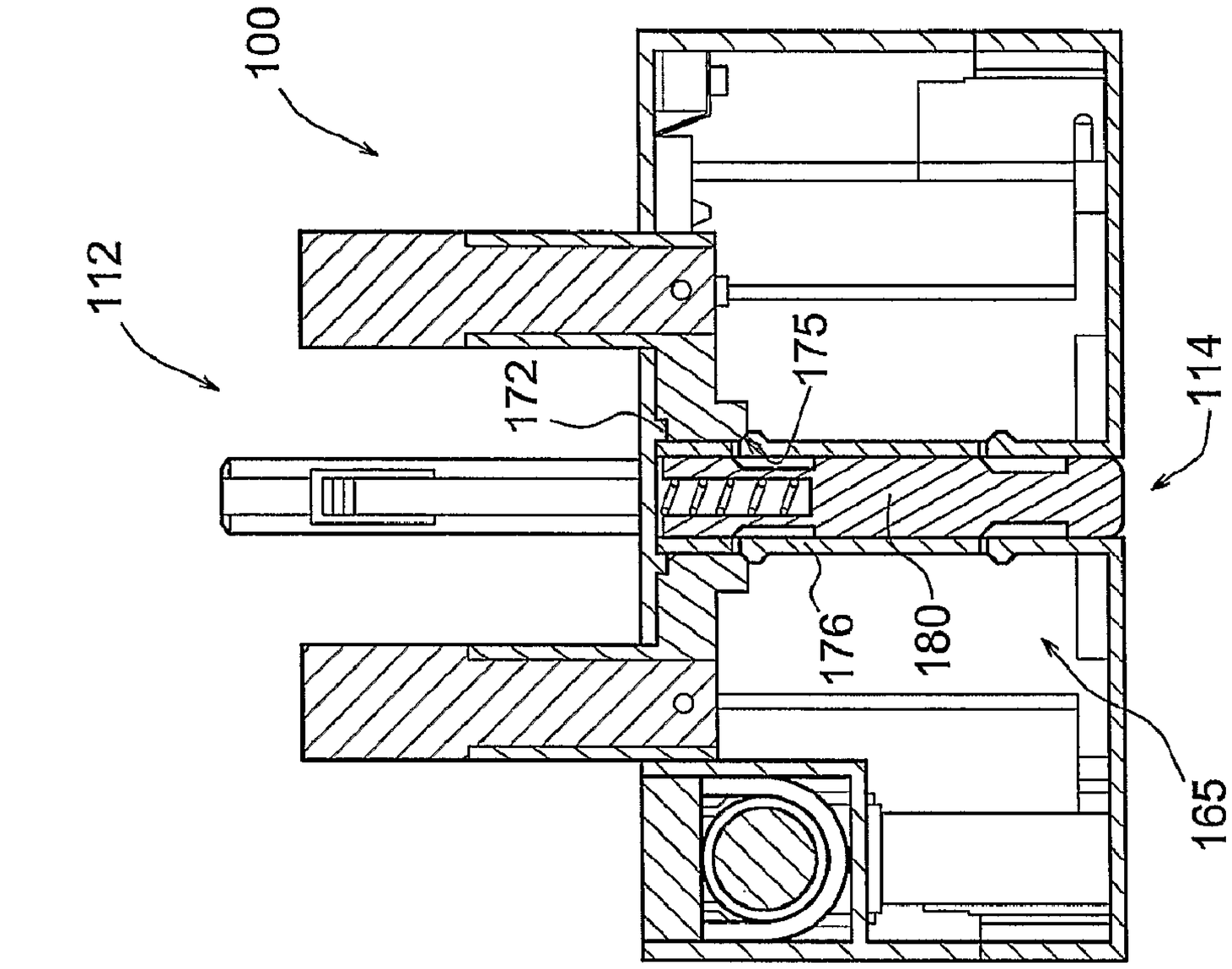
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FIG. 17

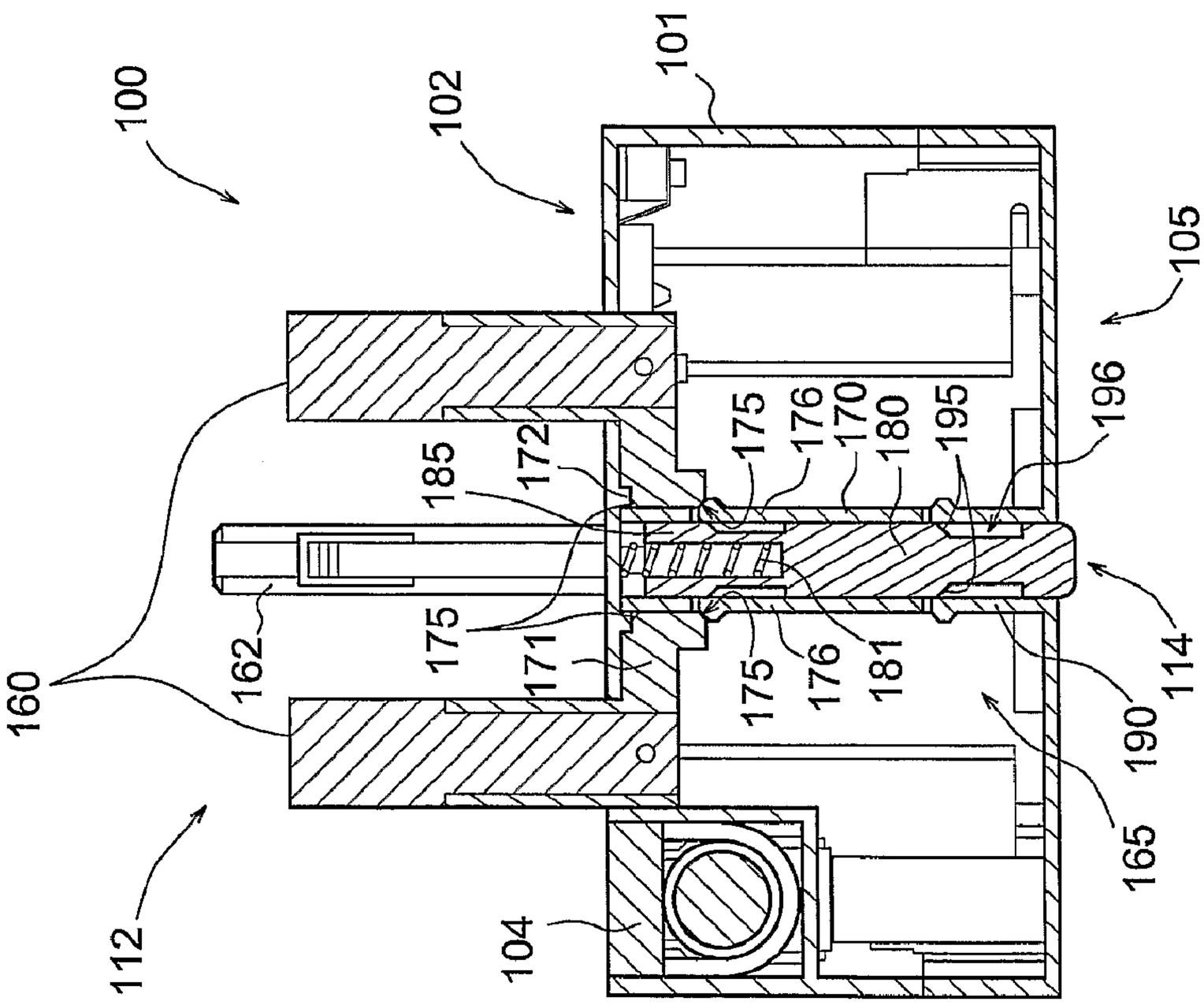
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FIG. 16

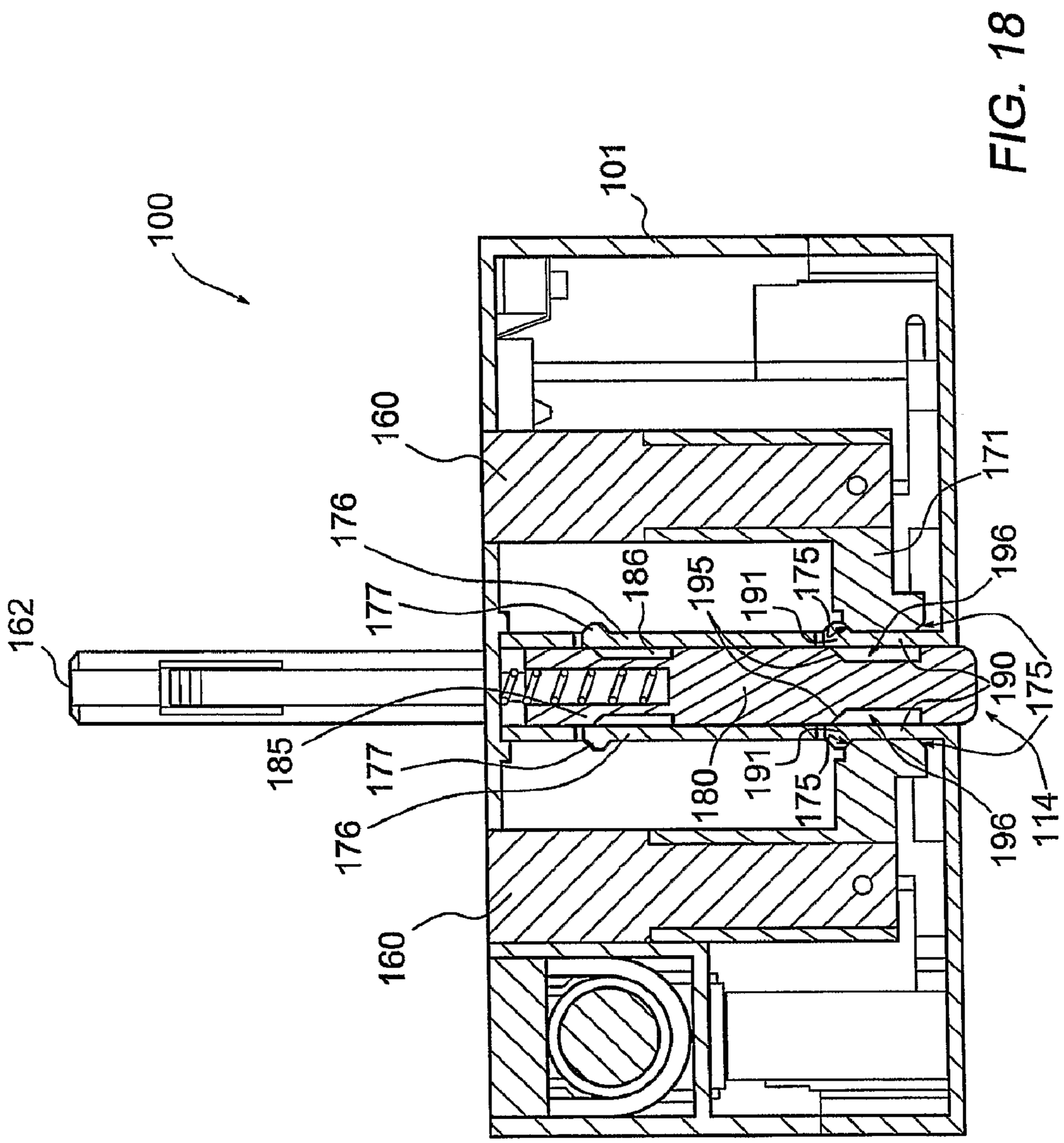
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FIG. 18

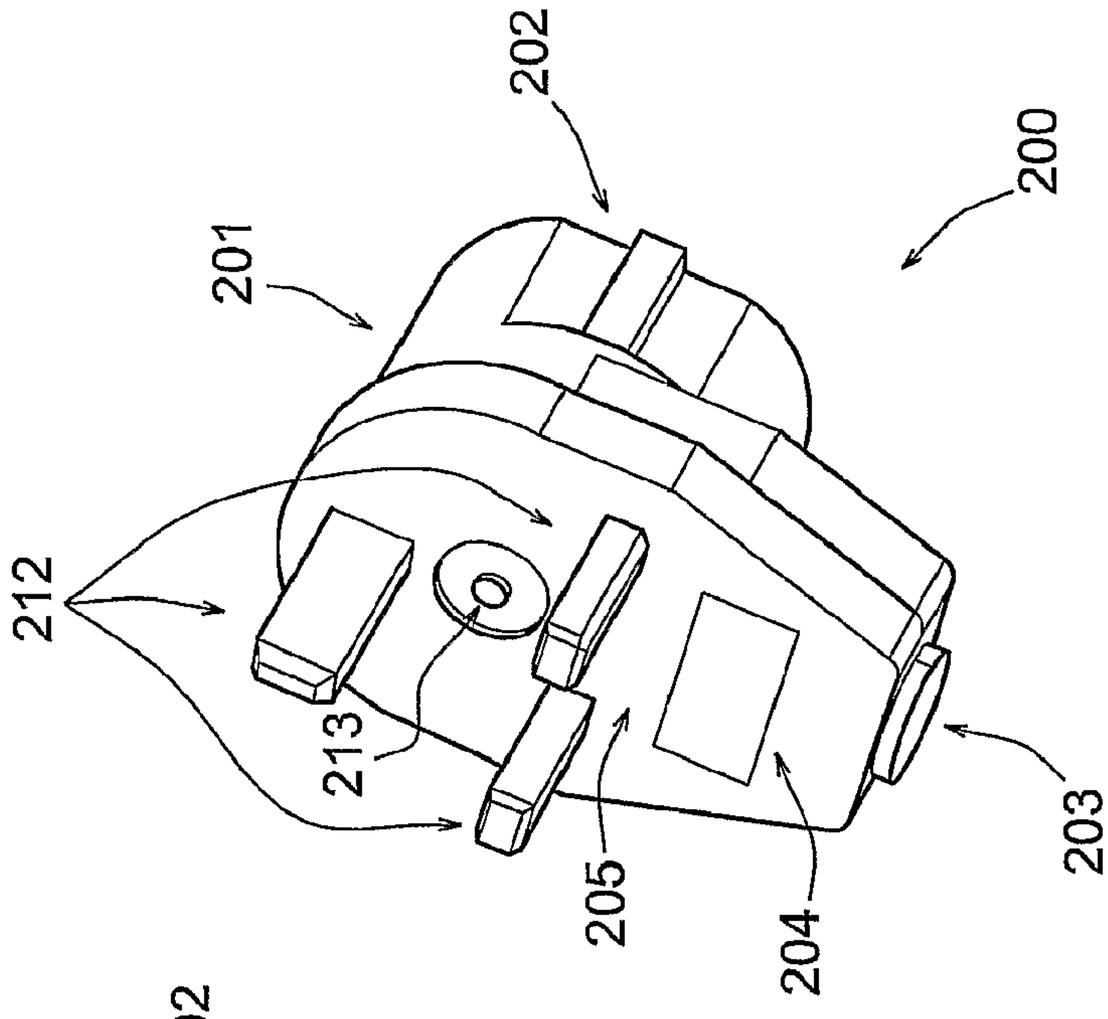



FIG. 19

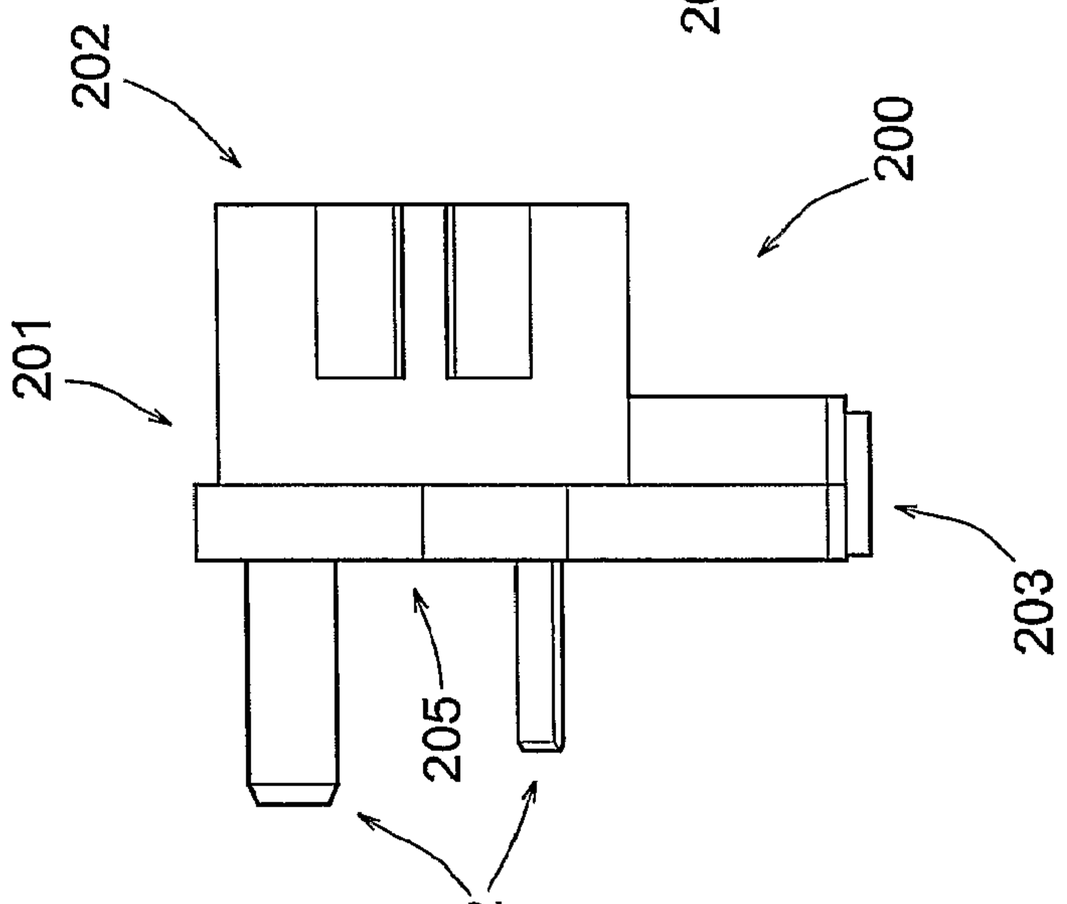



FIG. 20

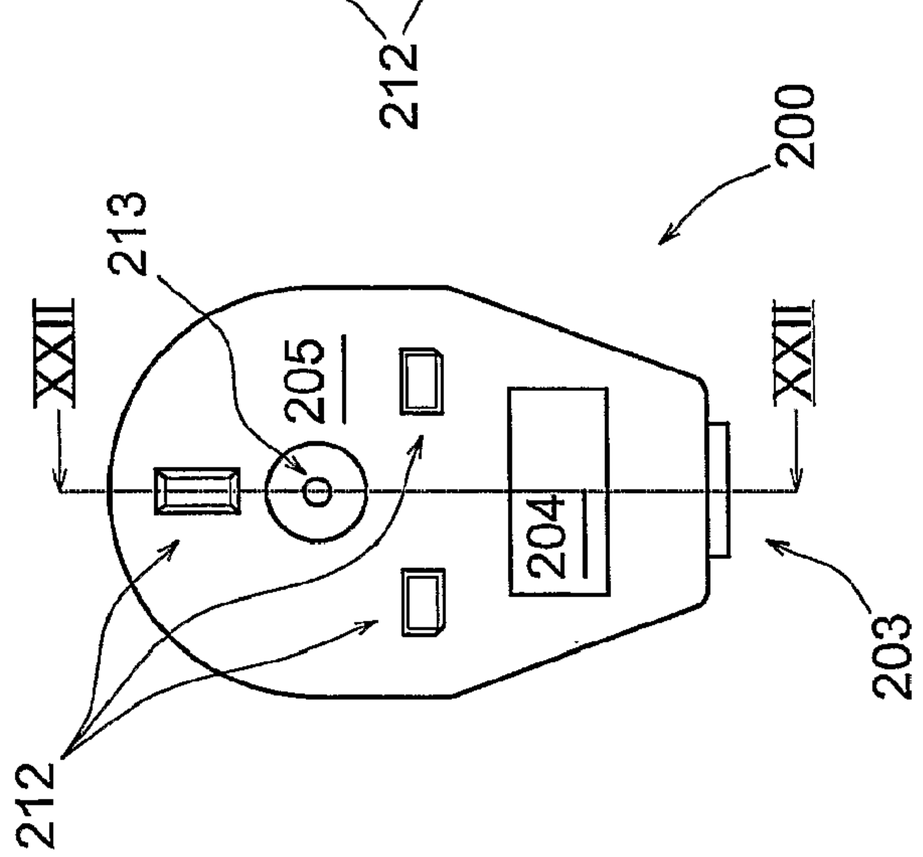
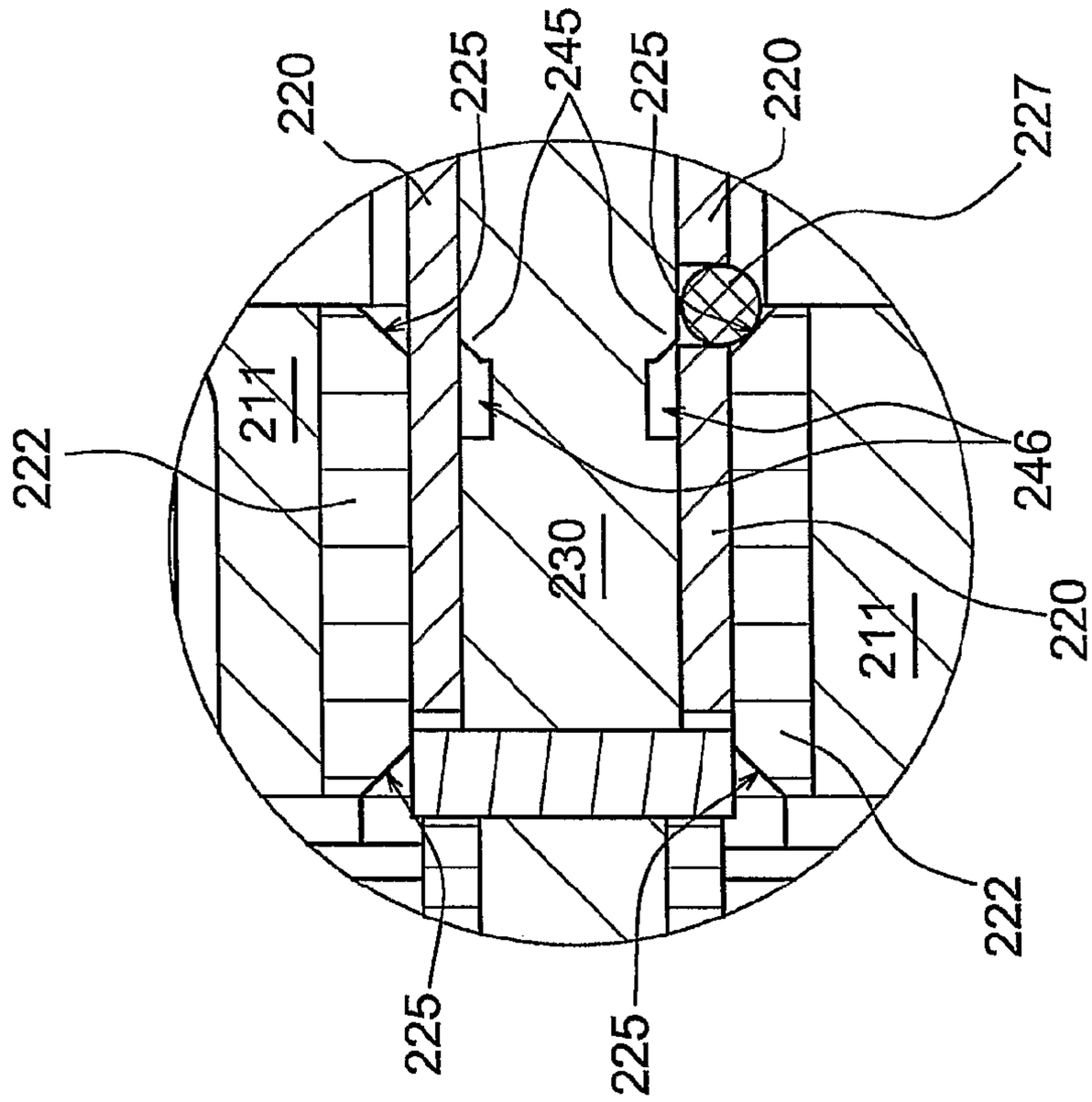



FIG. 21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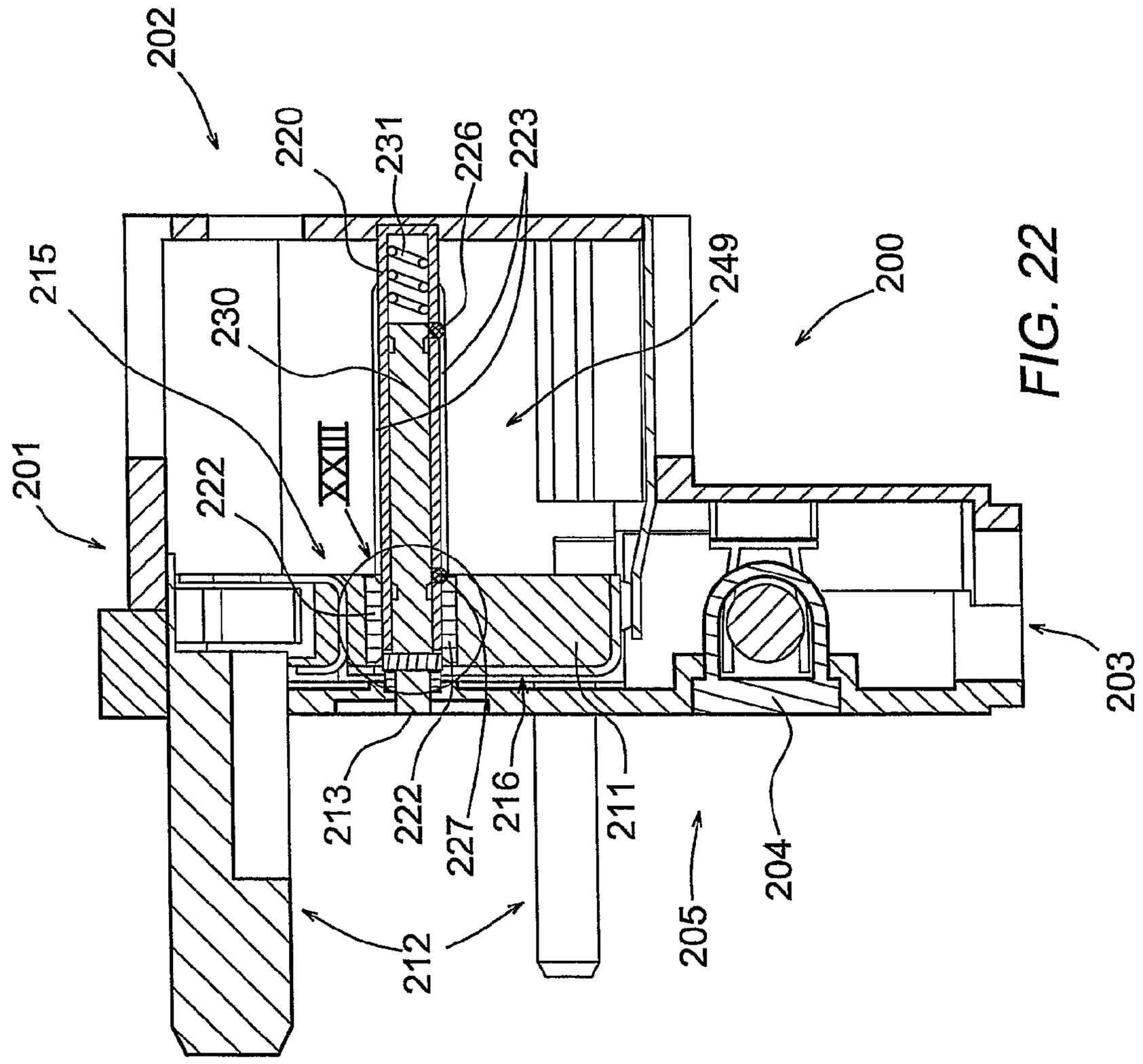
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FIG. 22

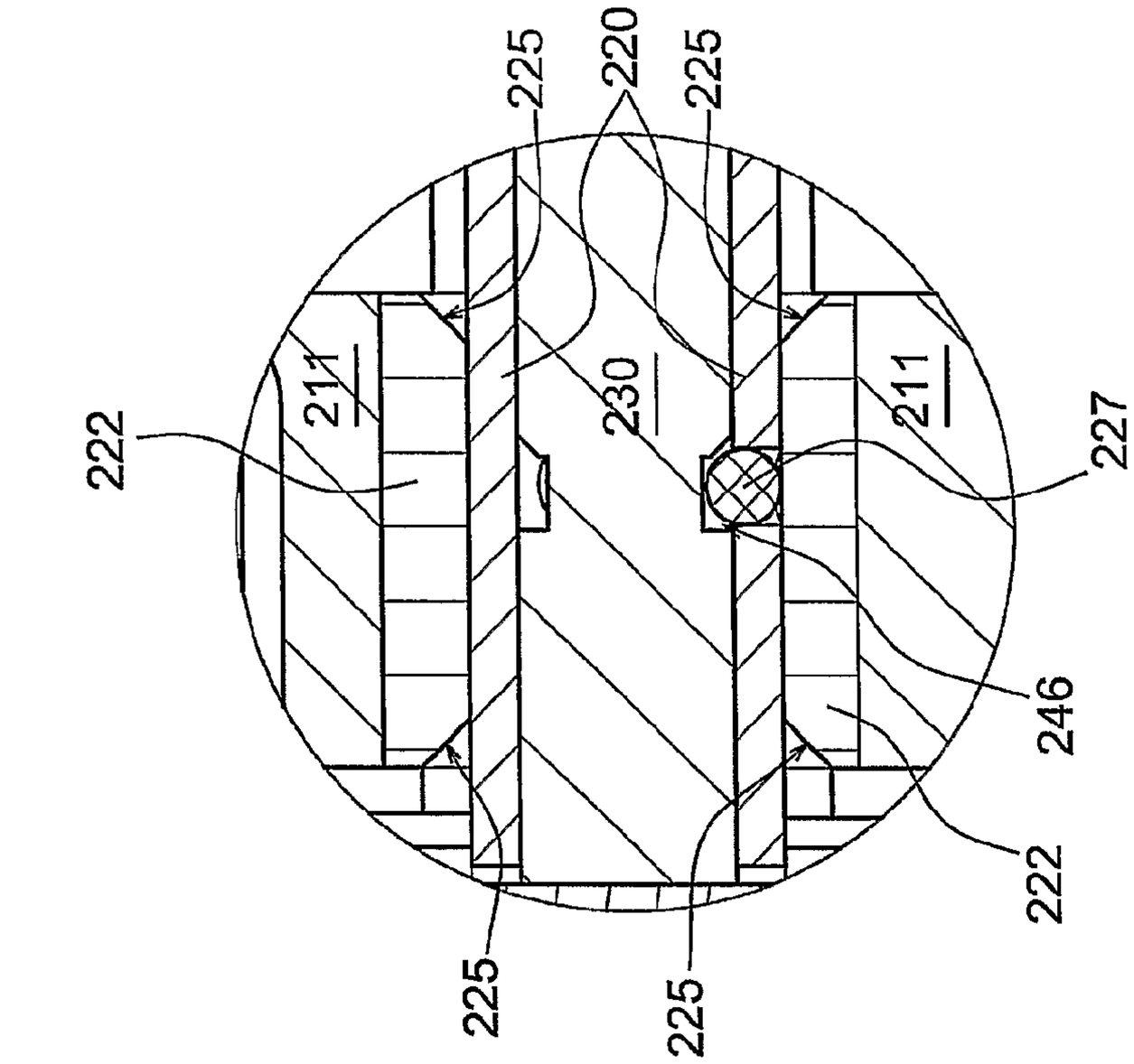
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FIG. 25

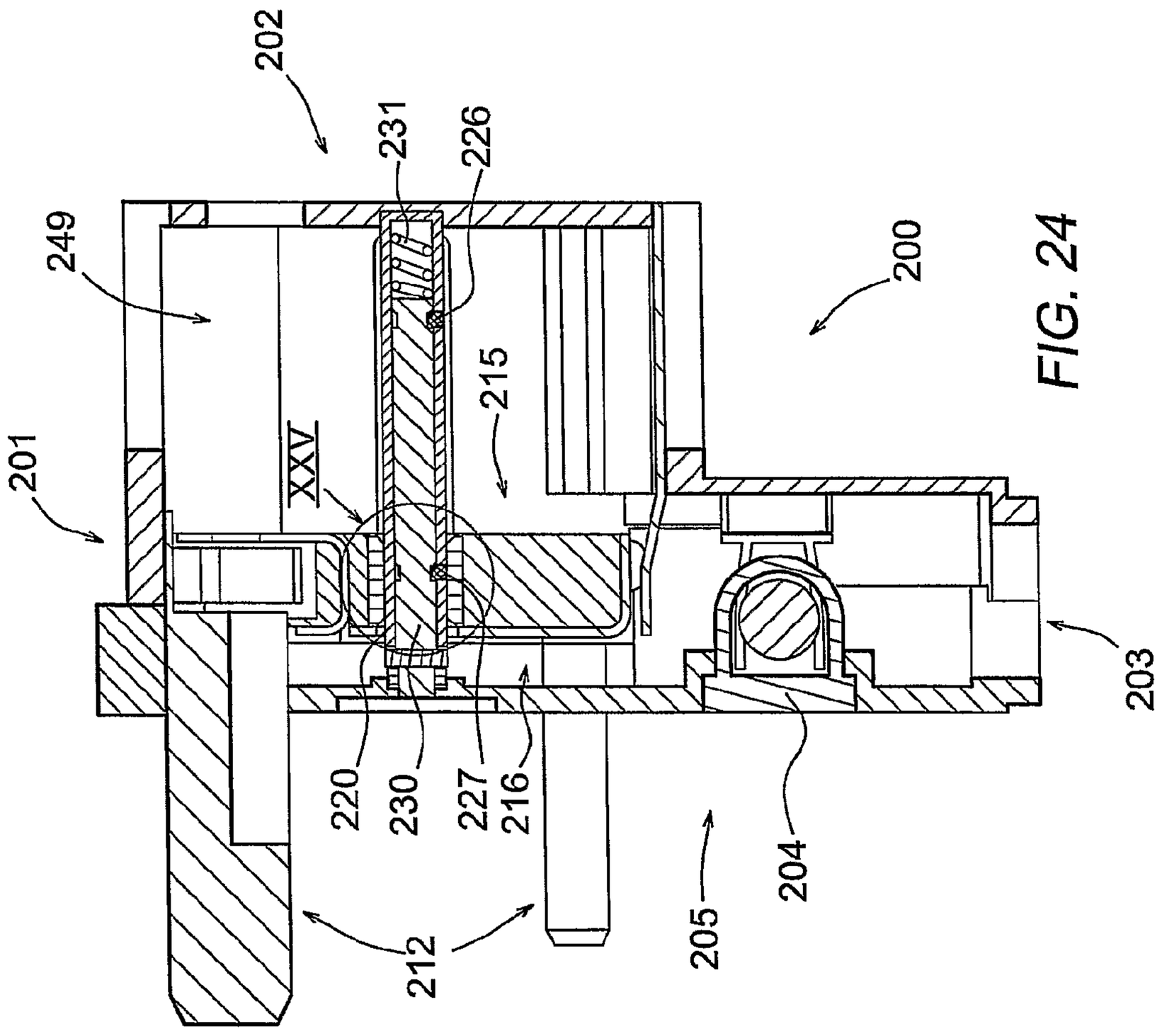
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FIG. 24

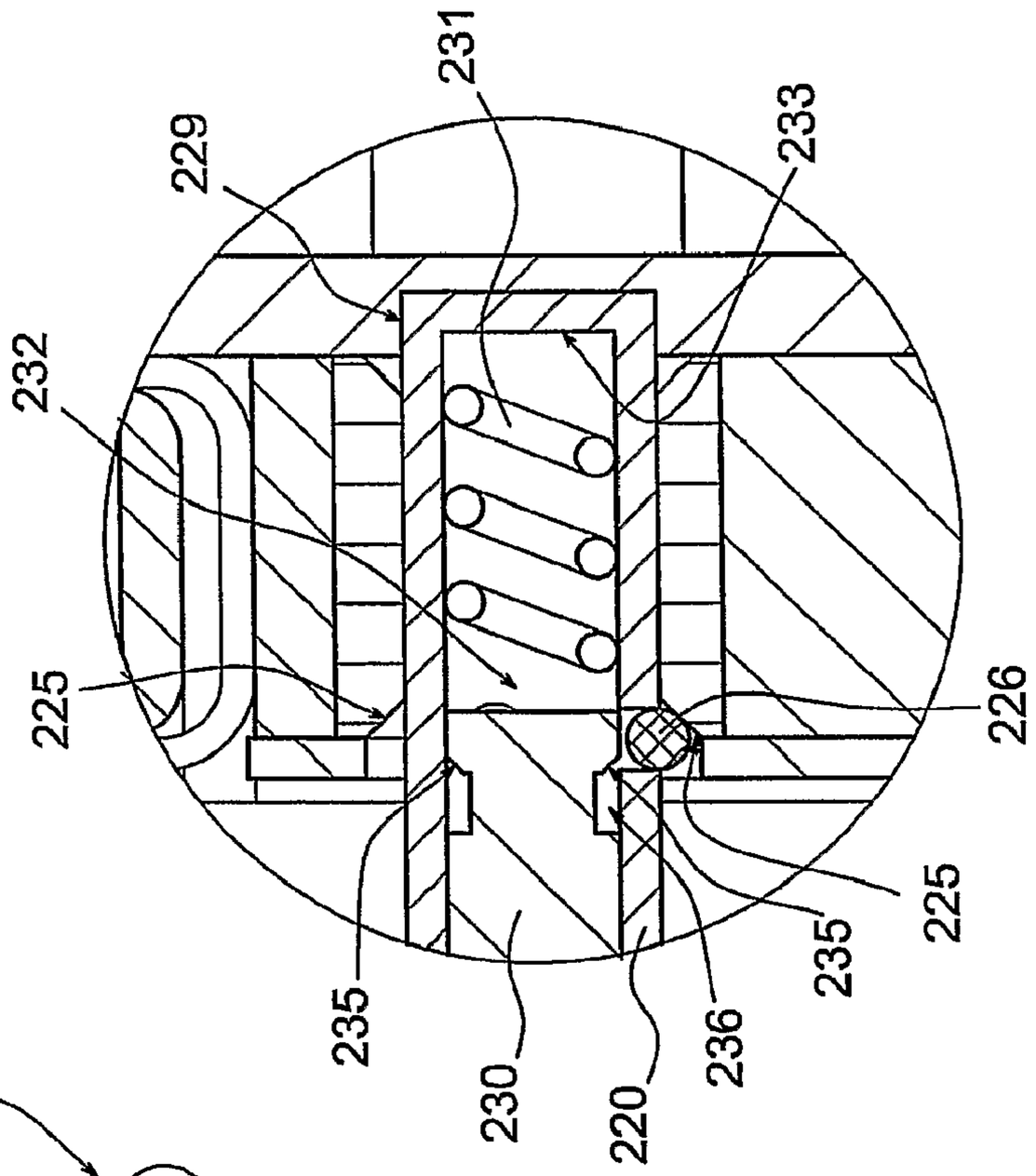
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FIG. 27

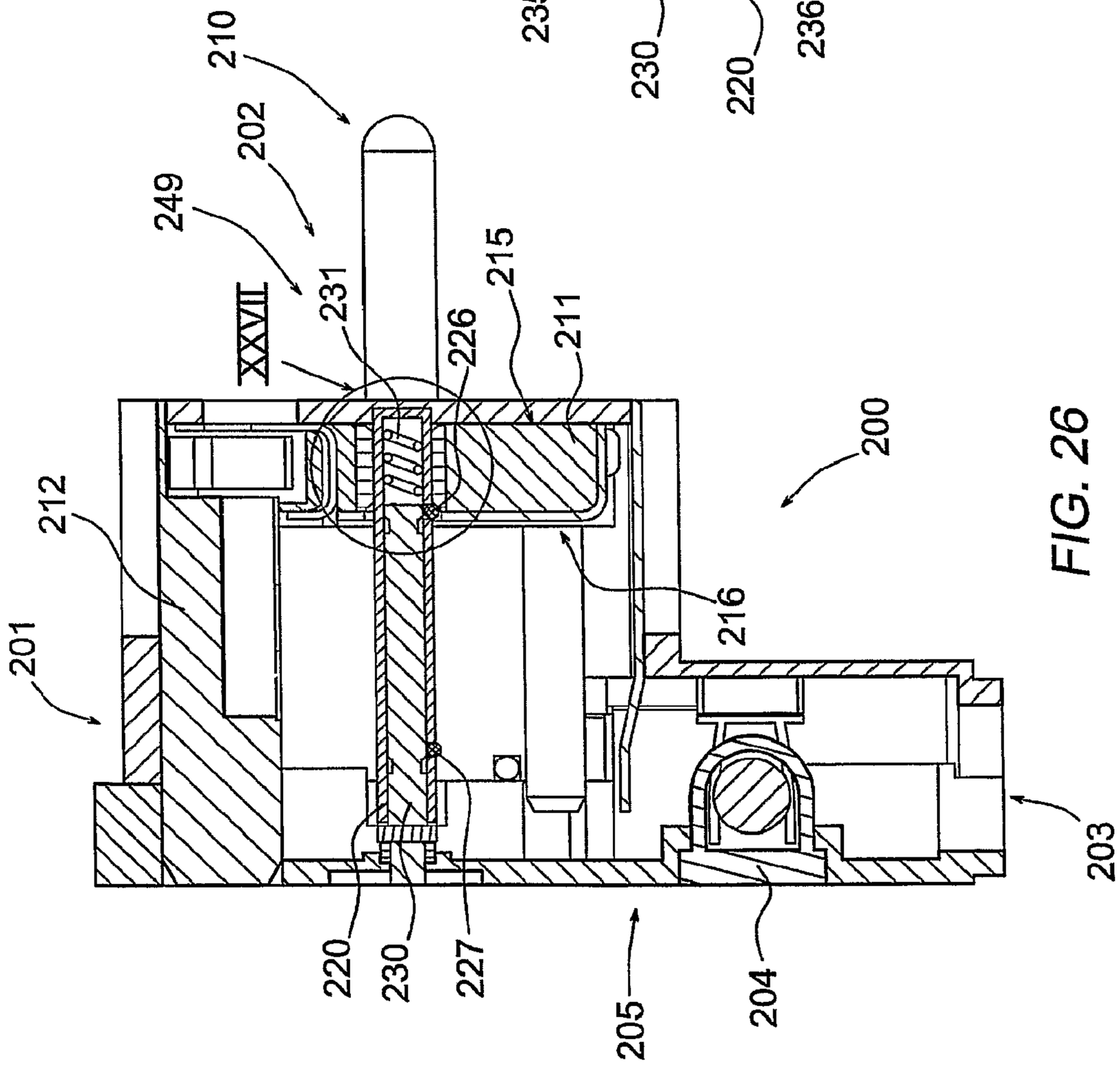
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FIG. 26

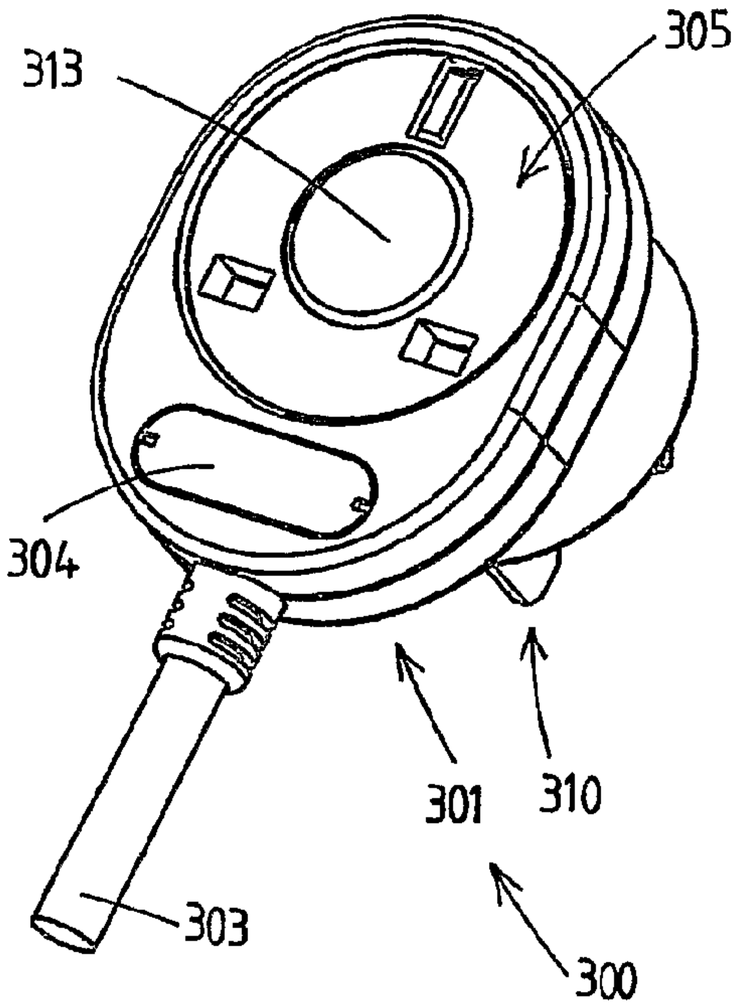


FIG. 28

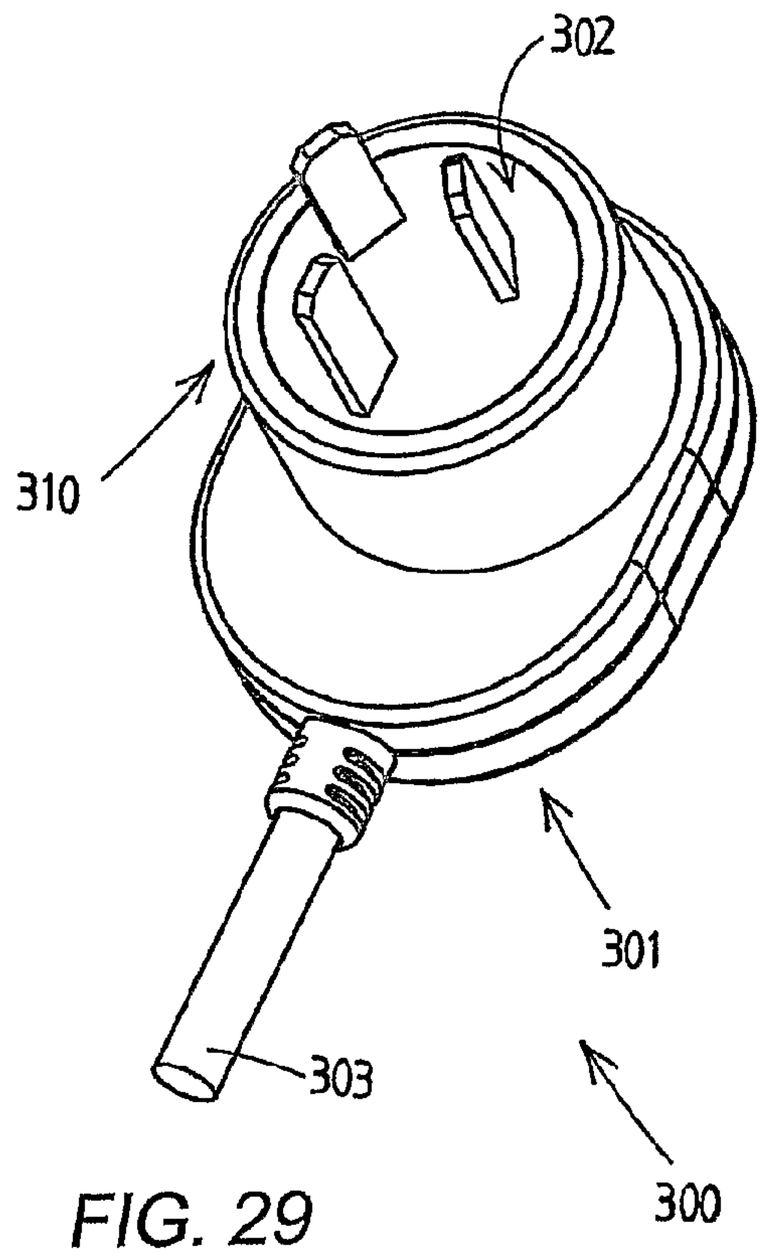


FIG. 29

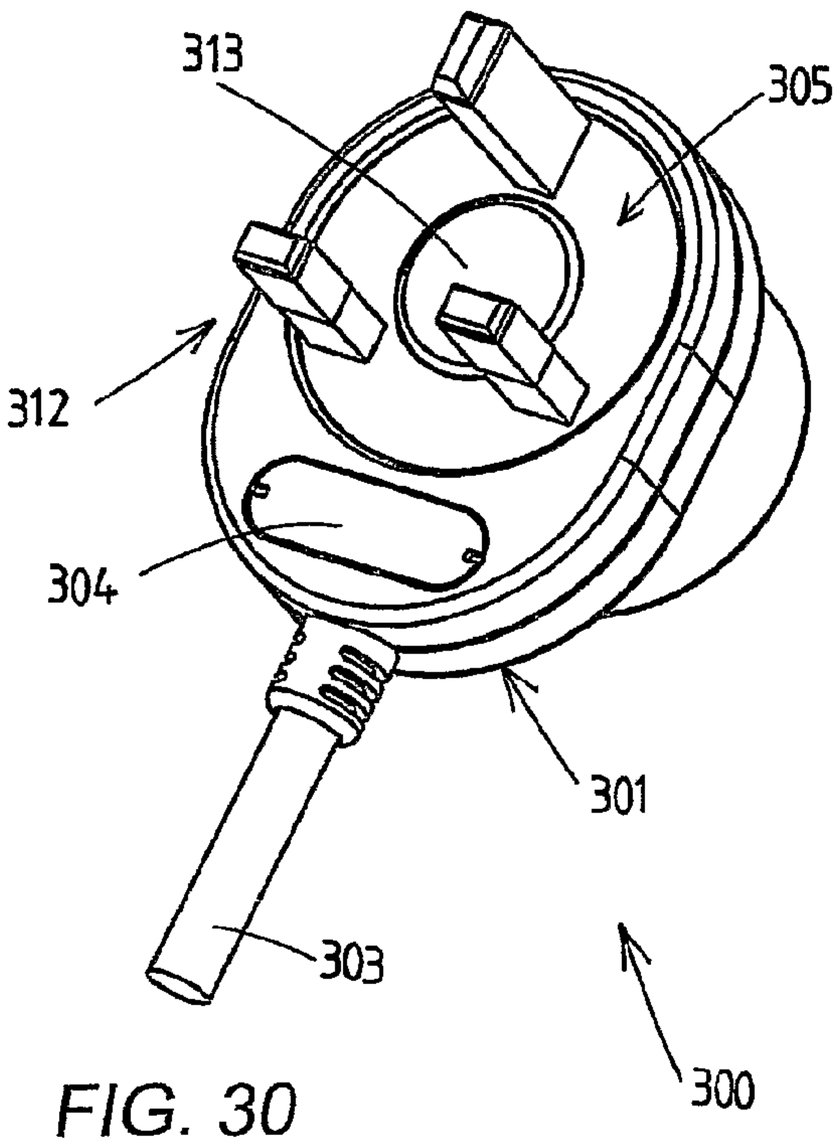


FIG. 30

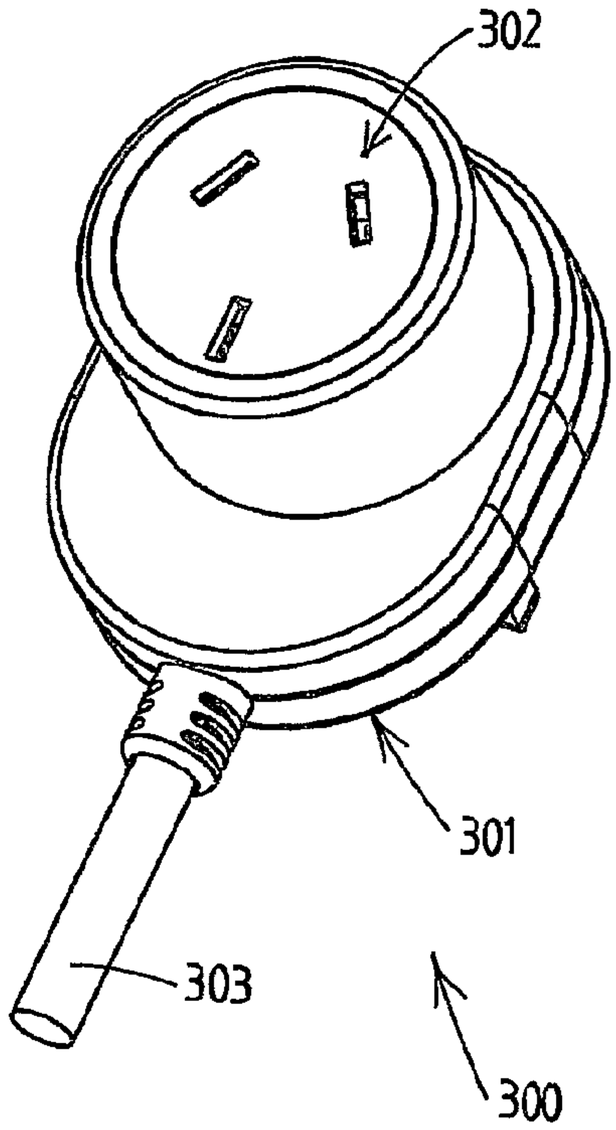


FIG. 31

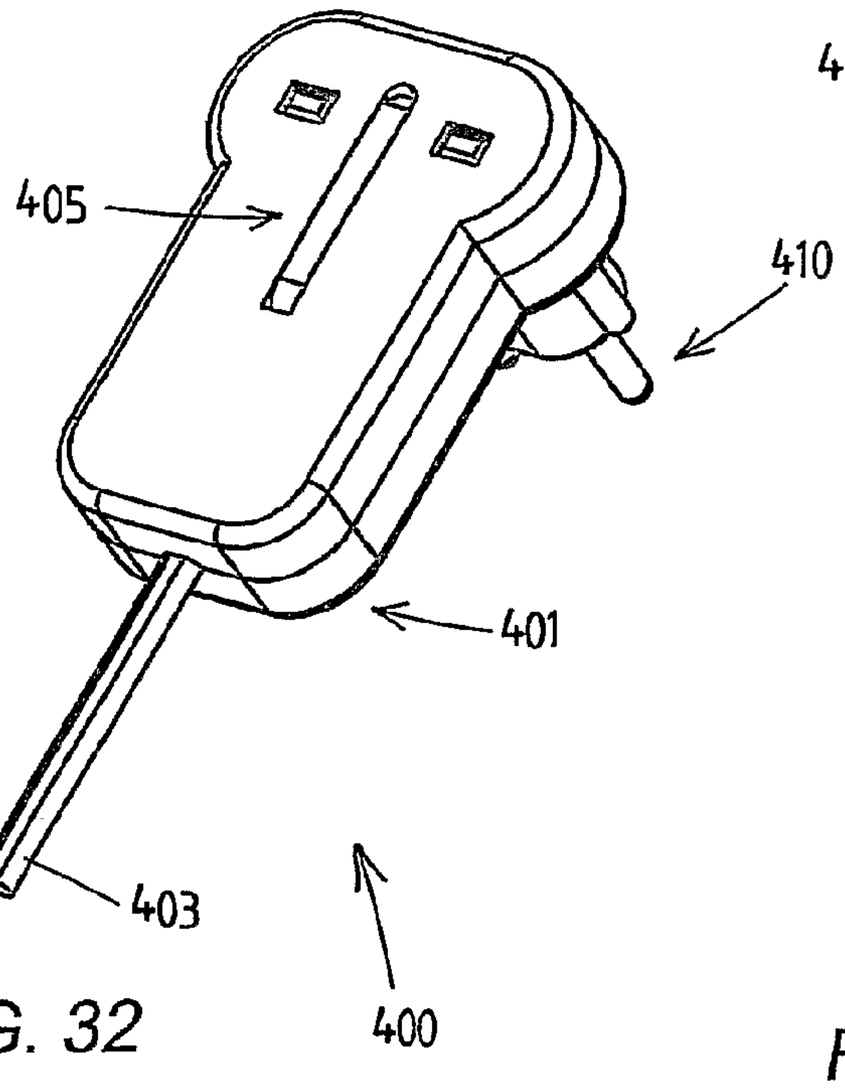


FIG. 32

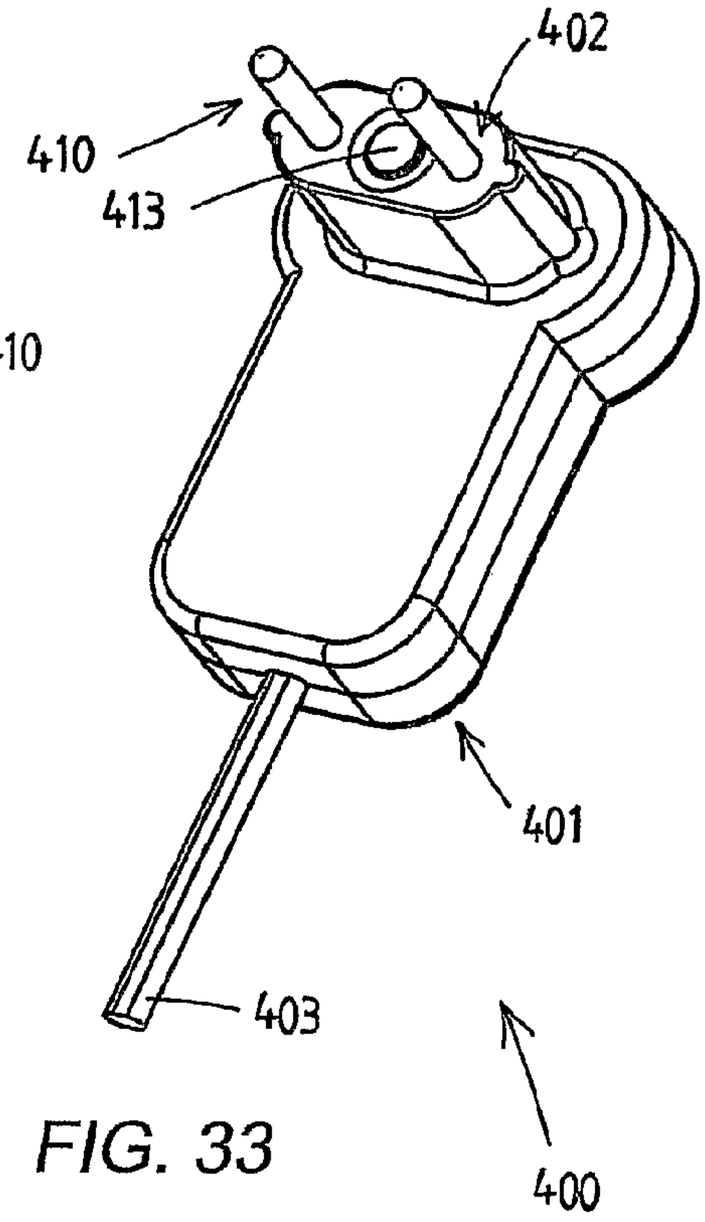


FIG. 33

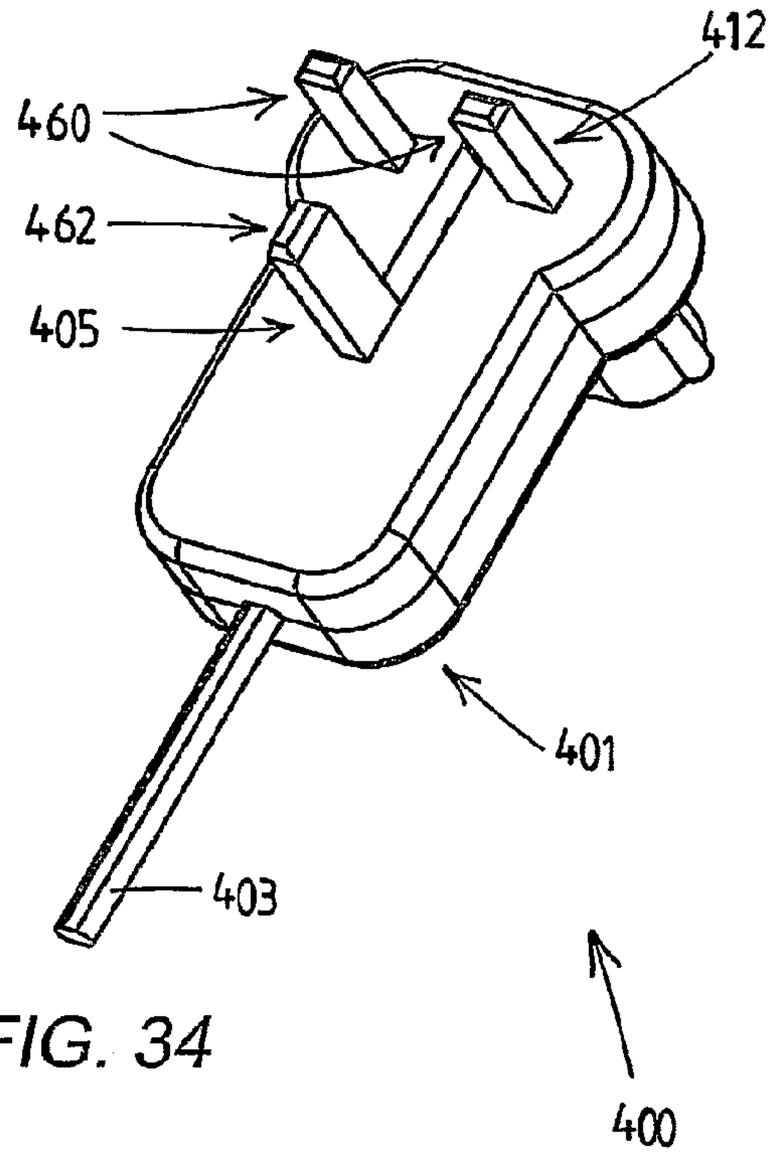


FIG. 34

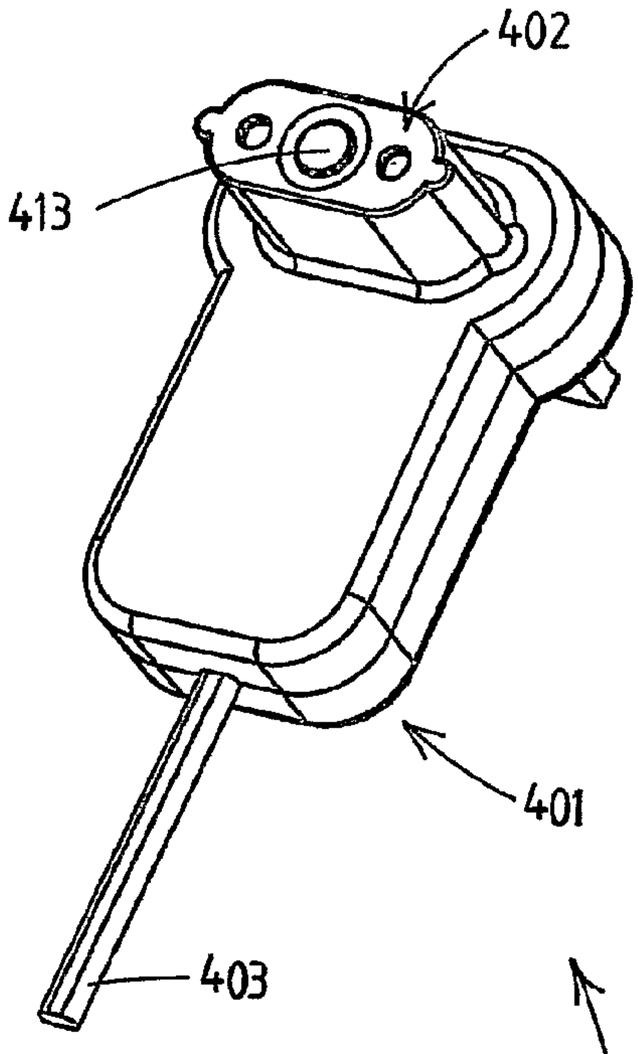


FIG. 35

# PLUG WITH SLIDABLE PINS AND BLOCKING DEVICE

## CROSS-REFERENCE TO RELATED APPLICATION

This application is the National Stage of International Application no. PCT/NL2006/000337 filed Jul. 5, 2006, which claims the benefit of Netherlands application number 1029478 filed Jul. 8, 2005 and of Netherlands application no. 1031429 filed Mar. 23, 2006, the contents of which are incorporated by reference herein.

## FIELD OF THE INVENTION

The invention relates to a plug with slidable pins and blocking device, according to the preamble of claim **1**.

## BACKGROUND OF THE INVENTION

WO-A2-02/063723 discloses a plug with a housing, out of which housing various sets of pins can be slid, each set being intended for a specific type of power point. The pins are slid out by means of levers which extend outside through separate slots in the housing. The levers and the pins of one type are in each case connected to each other inside the housing by a connecting part which is slidably accommodated in the housing.

The plug furthermore has a safety element. Said safety element is accommodated so as to be slidable laterally in the housing. Slidable laterally should be understood as meaning in a direction transversely to the sliding directions of the pins. The safety element is slid by means of a push button located on the outside of the housing.

The safety element comprises various retaining bars. Said retaining bars extend in the same direction as the pins. The retaining bars have a sloping sliding surface which merges by way of a straight sliding surface, i.e. a surface extending in the direction of the pins, into an opening. The connecting part of the pins is provided with sliding lugs. During the process of sliding out a set of pins by means of the lever, the sliding lugs slide along the sloping sliding surfaces of the retaining bars. Owing to the fact that the pins are fixed in the radial direction, this sliding along the sloping sliding surfaces results in the safety element sliding sideways. At the end of the retaining bars the sliding lugs reach the position of the corresponding openings of the retaining bars. Under spring force the sliding lugs fall into the openings, so that the safety element slides back and the safety element is locked with the pins.

A disadvantage of the known plug is that said plug can become less reliable in the long term as a result of wear. The projecting corners of the sliding lug and the opening can become worn and acquire, for example, a chamfered or rounded profile. The result is that the locking of the sliding lug in the opening becomes less reliable and the pins can be inadvertently pushed into the housing.

## SUMMARY OF THE INVENTION

The invention aims to eliminate this disadvantage at least partially, or in any case to provide a usable alternative.

In particular, the invention aims to provide a more reliable locking system which can retain its reliability also in the longer term.

The invention achieves this aim by means of a plug according to claim **1**.



The plug comprises a housing with a first contact face, a first set of pins for a first type of power point, and a first blocking device comprising interacting first and second blocking means. The first set of pins is slidably accommodated in the housing so as to assume an active or a passive position as desired, the first set of pins in the active position projecting from the first contact face of the housing in such a way that said set of pins can be inserted into the first type of power point. The first blocking means are connected to the first set of pins. The second blocking means are connected to the housing. The first and second blocking means are movable relative to each other, so that they can assume a blocking position, in which the slidability of the first set of pins is blocked, and an unblocking position, in which the first set of pins is slidable. The first blocking device furthermore comprises a first stopper, which first stopper is movable between a stop position, in which the movability of the first and second blocking means relative to each other is prevented, and a release position.

The stopper according to the invention provides a separate locking of the first and second blocking means, with the result that wear of the first and second blocking means less quickly leads to the blocking becoming less reliable.

In particular, the first stopper is movable in a sliding direction of the first set of pins. By making the stopper slidable in the same direction as the pins, it is ensured that an efficient use of space in the plug can be achieved. In the plug according to the prior art, on the other hand, the safety element slides transversely to the sliding direction of the pins, with the result that separate space has to be reserved for this inside the housing, at the axial end of the pins.

In one embodiment the second blocking means are intended to interact with the first blocking means to block the slidability of the first set of pins in the active position. The first blocking device furthermore comprises third blocking means, which are connected to the housing, for interacting with the first blocking means to block the slidability of the first set of pins in the passive position. In this way the blocking in both the active and the passive positions is achieved by the same blocking device, so that the first blocking means fulfils a dual function.

In particular, the first blocking device comprises a second stopper, which second stopper is movable between a stop position, in which the movability of the first and third blocking means relative to each other is prevented, and a release position. Thanks to the second stopper, the blocking in both the active and the passive positions can be reliably locked.

More particularly, the first and second stoppers are permanently connected to each other. This makes it possible to obtain one simple control system, in which by actuating one part both the first and the second stoppers can be moved into the release or the stop position.

In one embodiment the plug furthermore comprises a second set of pins for a second type of power point. In this way a so-called multiplug is formed, which multiplug advantageously can be used in several types of power points.

In particular, the plug furthermore comprises a double-sided sliding element, slidably accommodated in the housing so as to assume a first and a second position as desired. The double-sided sliding element comprises first and second pin faces. The second pin face is provided substantially diametrically opposite the first pin face. The first set of pins extends from the first pin face, and the second set of pins extends from the second pin face. The first set of pins in the first position projects from the first contact face of the housing in such a way that said set of pins can be inserted into the first type of power point. The second set of pins in the second position

projects from a second contact face of the housing in such a way that said set of pins can be inserted into the second type of power point.

The use of such a common sliding element results not only in a simple construction, but also in simple operation. The locking of the sliding element in the active position for the first set of pins corresponds to the locking of the second set of pins in their passive position.

In a variant the second set of pins comprises at least three pins, one of which pins is an opener for a fused power point, such as a British power point. Furthermore, the first set of pins is provided on a first sliding element which is provided so as to be slidable around the opener of the second set of pins. By providing the sliding element around the opener of the second set of pins it is possible, if desired, to dispense with separate guide means for fixing the first set of pins during the sliding movement in the radial direction. It is pointed out that in the prior art described above the sliding movement is only along the opener, so that in that case additional guide means do have to be provided. A plug which is slidable around the opener of the second set of pins therefore offers advantages compared with the prior art which are independent of the other aspects of the invention.

In particular, the first blocking means are provided on the first sliding element, and the second blocking means are on the opener. The opener is permanently connected to the housing, and the stopper is provided in the opener. By providing the second blocking means on the opener and the stopper in the opener, a compact and simple construction is obtained.

Further preferred embodiments are described in the subclaims.

## BRIEF DESCRIPTION OF THE DRAWINGS

The invention is explained in greater detail by means of preferred embodiments in the appended drawing, in which:

FIG. **1** shows a three-dimensional view of a first embodiment of a plug, with the European pins out;

FIG. **2** shows a side view of the embodiment of FIG. **1**;

FIG. **3** shows a front view of the embodiment of FIG. **1**;

FIG. **4** shows a section along line IV-IV of FIG. **3**;

FIG. **5** shows detail V of FIG. **4**;

FIG. **6** shows a three-dimensional view of the embodiment of FIG. **1**, with pins pushed in;

FIG. **7** shows a side view of FIG. **6**;

FIG. **8** shows a front view of FIG. **6**;

FIG. **9** shows a section along line IX-IX in FIG. **8**;

FIG. **10** shows a detail X of FIG. **9**;

FIG. **11** shows the same view as that of FIG. **9**, but with push button pressed;

FIG. **12** shows detail XII of FIG. **11**;

FIG. **13** shows a three-dimensional view of the first embodiment, with British pins pushed out;

FIG. **14** shows a side view of FIG. **13**;

FIG. **15** shows a front view of FIG. **13**;

FIG. **16** shows a section along line XVI-XVI of FIG. **15**;

FIG. **17** shows the same view as that of FIG. **16**, but with push button pressed;

FIG. **18** shows the same section as that of FIG. **16**, but with British pins pushed in;

FIG. **19** shows a three-dimensional view of a second embodiment of a plug, with the British pins out;

FIG. **20** shows a side view of the embodiment of FIG. **19**;

FIG. **21** shows a front view of the embodiment of FIG. **19**;

FIG. **22** shows a section along line XXII-XXII of FIG. **21**;

FIG. **23** shows detail XXIII of FIG. **22**;

FIG. **24** shows the same section as that of FIG. **22**, with push button pressed;

FIG. **25** shows detail XXV of FIG. **24**;

FIG. **26** shows the same section as that of FIGS. **22** and **24**, with the European pins out;

FIG. **27** shows detail XXVII of FIG. **26**;

FIG. **28** shows a three-dimensional view of a third embodiment of a plug, with the Chinese pins out;

FIG. **29** shows a three-dimensional view from an opposite direction of the plug of FIG. **28**;

FIG. **30** shows the plug of FIG. **28**, in the view of FIG. **28**, with British pins out;

FIG. **31** shows the plug of FIG. **28**, in the view of FIG. **29**, with British pins out;

FIG. **32** shows a three-dimensional view of a fourth embodiment of a plug, with integral charging electronics, with European pins out;

FIG. **33** shows a three-dimensional view from an opposite direction of the plug of FIG. **32**;

FIG. **34** shows the plug of FIG. **32**, in the view of FIG. **32**, with British pins out; and

FIG. **35** shows the plug of FIG. **32**, in the view of FIG. **33**, with British pins out.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. **1** shows a plug according to a first embodiment of the invention, which is indicated in its entirety by the reference numeral **100**. The plug **100** is intended for use as a mains plug for providing lighting and/or domestic appliances with power. The plug **100** comprises a housing **101**, with a contact face **102**. The housing **101** is furthermore provided with a lead-through aperture **103** (FIGS. **2** and **3**) for a power cable, and with a cover **104** for closing an aperture for fitting a fuse, as is required in some countries. The cover is provided in a part of a rear wall **105**. The rear wall **105** is the part of the housing **101** which is situated diametrically opposite the contact face **102**.

The plug is provided with a first set of pins **110**, the dimensions and mutual positioning of which make it suitable for use in a first type of power point, in the example shown a type of power point that is generally used on the continent of Europe. The pins **110** are slidably accommodated in a sliding housing **111**. The set of pins **110** and the sliding housing **111** together form a plug of the so-called flat type. This is a plug which can be provided on appliances for which no earth connection is required.

The sliding direction of the pins **110** is also referred to below as the axial direction, while a radial direction is crosswise to the axial direction. In this first exemplary embodiment the axial direction corresponds to a direction from the rear wall **105** towards the contact face **102**.

In FIG. **1** the ends of a second set of pins **112** are also visible, which second set of pins will be reverted to in more detail later in relation to FIG. **13** onwards. In FIG. **3** a first push button for the European flat plug, or Euro push button **113**, can also be seen. A British push button **114** can also be seen.

With reference to FIG. **4**, the sliding housing **111** is slidably accommodated in the housing **101**. For this purpose, sliding guide means are accommodated in the form of a sliding tube **120**. The first set of pins **110** is permanently connected to a first sliding element **121**, in this case a single-sided sliding element, also referred to as a bridge. The single-sided sliding element **121** is provided with two sliding lugs **122**, which are placed diametrically opposite each other and

can slide in grooves **123** of the sliding tube **120**. The single-sided sliding element **121** extends round the sliding tube **120**. In other words, the single-sided sliding element **121** is provided with an aperture which corresponds to the outside of the sliding tube **120**. Owing to the fact that the first sliding element **121** is of a certain thickness, the aperture can be seen as a tubular aperture.

The sliding tube **120** is provided with one or more first stops **124** (FIG. **5**). The first stops **124** are bevelled on their side facing the contact face **102**. The sliding lug **122** of the single-sided sliding element **121** is bevelled in a complementary manner. The sliding lug **122** is also bevelled on its axially opposite side. The bevelled sides or faces of the sliding lug **122** can be regarded as first blocking means **125**. The sliding tube **120** is provided with second blocking means in the form of blocking lips **126**. The blocking lips **126** are movably, in this example hingedly, connected to the sliding tube **120**. In this exemplary embodiment the blocking lips **126** are formed by leaving away material of the sliding tube **120** along three sides of the blocking lip **126**. Along the fourth side of the blocking lips **126**, i.e. the side where no material is left away, the material of the sliding tube **120** acts as a hinge. By selecting slightly elastic material for the sliding tube **120**, the strip of material concerned is not only hinged, but also elastic.

The blocking lip **126** is provided with a blocking lug **127**. The blocking lug **127** is provided with bevelled walls, the bevel of which corresponds to that of the bevelled sides **125** of the sliding lug **122**.

For the sake of completeness, it is pointed out that in the sectional drawing according to FIGS. **4** and **5** it appears as if one end **129** of the sliding tube **120** is not connected to the main part of the sliding tube **120**. This is the end **129** situated on the side of the first contact face **102**. It can be seen more clearly in FIGS. **9** and **13** that this is in fact a continuous sliding tube **120**, in which only the blocking lips **126** are partially detached from the remainder of the tube.

A stop element in the form of a stop bar **130** is accommodated in the sliding tube **120**. A first end of the stop bar **130** acts as the Euro push button **113** here. The other end of the stop bar **130**, i.e. the end of the stop bar **130** projecting from the contact face **102**, is provided with spring means in the form of a coil spring **131**. The coil spring **131** is accommodated in an opening **132** on the axial end of the stop bar **130**, and projects partially from said end face **132**. The coil spring **131** rests on one side in the opening and on the other side on an inside edge **133** of the end **129** of the sliding tube **120**.

The stop bar **130** is provided with one or more first stoppers **135**. The stoppers **135** can be regarded as lugs or radially projecting parts on the outside wall of the stop bar **130**. In this case there can be two or more stoppers **135**, or there can be one stopper **135** extending in the circumferential direction round the stop bar **130**. It is pointed out that the central part of the stop bar **130** has the same external diameter as the external diameter of the circumference round the stoppers **135**. This is in particular functional for the slidable accommodation of the stop bar **130** in the sliding tube **120**. However, the diameter of this central part of the stop bar is not relevant for the stop function of the stoppers **135**. What is relevant is that the diameter of the part **136** of the stop bar **130** which in the axial direction directly adjoins the first stoppers **135** has a smaller diameter than the diameter round the circumference of the stoppers **135**. As will emerge below, the recessed part **136** of the stop bar **130** has a function in the releasing of the blocking means.

FIGS. **6-10** show the plug **100** in a position in which both the first set of pins **110** and the second set of pins **112** are slid into the housing, but not the opener to be described below. FIGS. **9** and **10** show the interaction between the above-described first blocking means **125** of the single-sided sliding element **121** and the third blocking means to be described below.

In FIGS. **9** and **10** the single-sided sliding element **121**, the first set of pins **110** connected to it (not visible in this section) and the sliding housing **111** are pushed fully into the housing **101**. It is pointed out that the axial end of the sliding housing **111** lies in the same plane as the contact face **102**, as can be seen in FIG. **6**.

The sliding tube **120** is provided with third blocking means, in the form of blocking lips **140**. The blocking lips **140** are provided with blocking lugs **141**. The blocking lugs **141** have bevelled sides which correspond to the bevel of the first blocking means, or the bevelled faces **125** of the sliding lug **122**. In the space between the sliding housing **111** and the sliding tube **120** spring means **142** are also provided, in the form of a coil spring. The coil spring **142** acts, at least in the position shown in the drawing, upon the single-sided sliding element **121** and upon the inside of the housing **101**. In this way the coil spring **142** exerts an axial force from the rear wall **105** of the housing **101** towards the contact face **102**.

The stop bar **130** is provided with a second stopper **145**. The second stopper **145** at a first axial end merges into the above-described central part of the stop bar **130**. At its second axial end the second stopper **145** adjoins a part **146** of the stop bar **130** with a reduced diameter.

The blocking lip **140** in this example is formed from and connected to the sliding tube **120** in a comparable way to that of the first blocking lip **126**.

Thus a first blocking device **149** is formed, comprising the bevelled faces **125**, blocking lips **126** and **140** with blocking lugs **127** and **141** respectively, and the axial stop bar **130** with stoppers **135** and **145**.

In use, the Euro push button **113** can be pressed in the axial direction, as shown in FIGS. **11** and **12**. Operating, i.e. pressing, the Euro push button **113** causes the stop bar **130**, and therefore also the stoppers **135** and **145**, to move in the axial direction. The axial movement of the stoppers **135** and **145** means that said stoppers move in the axial direction relative to the blocking lips **126** and **140**, thereby releasing the blocking lips **126** and **140**. In other words, the blocking lips **126** and **140** come to rest at the position of the parts **136** and **146** of the blocking bar **130** with reduced circumference. The first stopper **135** and the second stopper **145** are thus moved from a stop position to a release position. In the stop position the radial movability of the blocking lips **126** and **140** relative to the sliding lug or the first blocking means **125** was prevented. In the release position the blocking lips **126** and **140** are movable in the radial direction, as shown by arrows **150** for the second blocking lips **140**.

Partly as a result of the bevelled shape of the blocking lugs **127** and **141** respectively and the bevelled sides **125** of the sliding lug **122**, the sliding lug **122** can move the blocking lips **126** and **140** out of their blocking position (shown) into an unblocking position (not shown). In the unblocking position (not shown) the sliding lips **126** and **140** are situated in the opening that is formed by the parts **136** and **146** of the stop bar **130** that have a reduced cross section.

From the position in FIGS. **11** and **12** the coil spring **142**, in the release position of the stopper **145**, as shown in FIG. **11**, will provide for the blocking lips **126** and **140** to be pushed into the unblocking position. From the pushed-out, active position of the first set of pins **110** and the sliding housing **111**, as shown in FIGS. **1-4**, the user himself will push the single-sided sliding element **121** inwards in the axial direction and in so doing push the blocking lip **126** radially

inwards. For this purpose, the user can exert force upon the first set of pins **110** and/or the sliding housing **111**.

FIGS. **13-18** show the same first embodiment of the plug **100**, in which the mode of operation of the second set of pins **112** is explained. The second set of pins **112** comprises two live pins **160** and an opener **162**. The opener **162** is also referred to as an earth pin, but because the plug **100** in the exemplary embodiment shown is not earthed, the term opener is a better description here. For British power points a pin must in fact be present at the position of the earth pin even in the case of non-earthed plugs, in order to unblock the power point concerned.

The opener **162** in this exemplary embodiment is the equivalent of the sliding tube **120**, and in this embodiment is permanently connected to the housing **101**. For the British pins **112**, and in particular the two slidable pins **160**, a second blocking device **165** is provided.

The plug **100** comprises sliding guide means in the form of a second sliding tube **170**, which is permanently connected to the housing **101** and extends inside the housing from the rear wall **105** to the contact face **102**. This direction will hereinafter be referred to as the axial direction, and is also the sliding direction for the pins **160**.

A stop **172** is provided on the inside of the contact face **102**, which stop extends round the second sliding tube **170**. The pins **160** are connected to a second, likewise single-sided sliding element, in this case a bridge **171**. The bridge **171** is provided with an aperture which extends round the sliding tube **170**. The thickness of the bridge **171** at the position of the aperture is such that this is a matter of a tubular aperture in the bridge **171**, which tubular aperture extends round the sliding tube **170**. The bridge **171**, or at any rate its tubular aperture, is provided with two bevelled faces which bound the tubular aperture in the bridge **171**. Said bevelled faces **175** act as the fourth blocking means.

The sliding tube **170** is provided with fifth blocking means in the form of third blocking lips **176** with blocking lugs **177**. The blocking lugs **177** are bevelled for interaction with the bevelled faces **175** of the bridge **171**. The blocking lips **176** are formed from the sliding tube **170** in a comparable way to the blocking lips described earlier.

The slanting faces **175** and the third blocking lips **176** with blocking lugs **177** are part of the second blocking device **165**. The second blocking device **165** furthermore comprises a second stop element in the form of a second stop bar **180**. The stop bar **180** is provided with a coil spring **181** on an axial end. The stop bar **180** is furthermore provided with a third stopper **185**. The third stopper **185** is formed by an opening, i.e. a part **186** of the stop bar **180** with a reduced diameter which axially adjoins the stopper **185**.

The sliding tube **170** is furthermore provided with fourth blocking lips **190**, having fourth blocking lugs **191**. The second stop bar **180** is provided with fourth stoppers **195**. The fourth stoppers **195** are formed by means of an opening **196** in the stop bar **180**. These fourth blocking lips **190** and fourth stoppers **195** can also be regarded as parts of the second blocking device **165**.

In the use position shown in FIG. **16** the plug **100** is ready for use in combination with a British power point. The pins **160** are blocked by the interaction of the fourth blocking means **175** and fifth blocking means **176**. In this case the stopper **185** prevents radial movability of the blocking means **176** relative to the blocking means **175**. A certain blocking of the pins **160** is thereby obtained.

In FIG. **17** a user has pressed the British push button **114** and thereby moved the stop bar **180** in the axial direction. This makes the stopper **185** move in the axial direction away from the blocking lips **176**, and the blocking lips **176** are movable in the radial direction relative to the blocking faces **175** of the bridge **171**. By exerting pressure in the axial direction upon the bridge **171**, for example by way of the pins **160**, the bridge **171** with the pins **160** can now be slid inwards along the sliding tube **170**. The blocking lips **176** are moved radially inwards in the process.

After the pins **160** have been slid in fully and in the meantime the push button **114** has been released by the user, the situation shown in FIG. **18** is produced. This is in fact the same situation as that shown in FIGS. **6-10**, but in this case at the position of the same sectional plane as that in FIGS. **16** and **17**. The bridge **171** is blocked in this position by blocking lips **190**, more particularly by the blocking lugs **191** provided on the blocking lips **190**. Thanks to the stoppers **195**, the blocking lips **190** and the blocking faces **175** on the bridge **171** cannot move relative to each other in this position, with the result that the pins **160** are blocked in the passive position shown in FIG. **18**. The release from this blocked passive position is performed in a way corresponding to that described above in relation to the release from the active position.

The figures described above do not show that the first set of pins **110** and the second set of pins are disconnectably electrically connected by means of contacts to power cables which are run through the cable lead-through aperture **103** to the outside of the plug **100**. Thanks to the contacts, only one set of pins at a time is connected to the power cables.

FIG. **19** shows a plug **200** according to a second embodiment of the invention. The plug **200** is intended for use as a mains plug, for earthed applications. The plug **200** comprises a housing **201** with a first contact face **202**. The housing **201** is furthermore provided with a lead-through aperture **203** for a power cable and a cover **204** for a fuse. The housing **201** furthermore comprises a second contact face **205**, which is provided substantially diametrically opposite the first contact face **202**. The shape and dimensions of the first contact face **202** correspond to those of an earthed power point of a first type, in this case of the type usually found on the continent of Europe. The shape and dimensions of the second contact face **205** correspond to those of power points of a second type, in this case, for example, of the type usually found in the British Isles.

The plug **200** is provided with a first set of pins **210** (FIG. **26**), which is suitable for use in the first type of power point. The first set of pins **210** is provided on a sliding element **211**, in this case a double-sided sliding element **211**. The sliding element **211** is slidably accommodated in the housing **201**, so that it can optionally assume a first position (FIG. **22**) and a second position (FIG. **26**).

The plug furthermore comprises a second set of pins **212** (FIGS. **19-24**), suitable for the second type of power point, and a push button **213**. The push button **213** is recessed in the second contact face **205**.

The sliding element **211** comprises a first pin face **215**. The first set of pins **210** extends from the first pin face **215**, in this case perpendicularly to the pin face **215**. For this purpose, the first set of pins **210** is permanently connected to the sliding element **211**. The sliding element **211** furthermore comprises a second pin face **216**, from which the second set of pins **212** extends. The second set of pins **212** is located so as to be perpendicular to the second pin face **216** and is permanently connected to the double-sided sliding element **211**. The first pin face **215** and second pin face **216** of the sliding element **211** are provided diametrically opposite each other on the sliding element **211**.

With reference to FIGS. **22-27**, the double-sided sliding element **211** is slidably accommodated in the housing **201**. For this purpose, sliding guide means are provided in the form of a sliding tube **220**. The double-sided sliding element **211** is provided with two sliding lugs **222**, which are placed diametrically opposite each other and can slide in grooves **223** of the sliding tube **220**. The sliding tube **220** extends from the first contact face **202** to the second contact face **205**. For what follows below the axial direction is defined as the sliding direction of the double-sided sliding element **211**, which in this case is determined by the longitudinal direction of the sliding tube **220**.

The double-sided sliding element **211** extends round the sliding tube **220**. For this purpose, the double-sided sliding element **211** is provided with an aperture, in particular a tubular aperture, the dimensions of which substantially correspond to the outside of the sliding tube **220**.

The sliding lugs **222** are bevelled on two sides situated diametrically opposite each other to form fourth blocking means, or blocking faces **225**. It is pointed out that the blocking faces **225** are situated on the axial ends of the sliding lugs **222**.

The sliding tube **220** is provided with fifth and sixth blocking means, in the form of first and second blocking balls **226** and **227**. The first and second blocking balls **226** and **227** are movably connected to the sliding tube **220** in such a way that they are movable in the radial direction relative to the sliding tube **220**, and are fixed, i.e. not movable, in the axial direction of the sliding tube **220**.

The sliding tube **220** is accommodated with a first end **229** in the part of the housing **201** which forms the first contact face **202**.

A stop element in the form of a stop bar **230** is accommodated in the sliding tube **220**. A first end of the stop bar **230** acts as the push button **213** here. At the other end of the stop bar **230** spring means are provided in the form of a coil spring **231**. The coil spring **231** rests on one side on the axial end face **232** of the stop bar **230** and rests on the other side on an inside edge **233** of the end **229** of the sliding tube **220**.

The stop bar **230** is provided with a first stopper in the form of a stop ring **235**. The stop ring **235** is bounded at its first axial end by the end face **232**. At its second axial end the stop ring **235** is bounded by a part of the stop bar **230** with a reduced cross section **236**. Owing to the fact that the remainder of the stop bar **230**, notably the central part of the stop bar **230**, has an external diameter which corresponds to the external diameter of the stop ring **235**, the part **236** with a reduced cross section can also be regarded as a circular opening or groove **236**.

The stop bar **230** is furthermore provided with a second stopper **245**. The second stopper **245** can be regarded as a second stop ring **245**, which extends round the external surface of the stop bar **230**. The second stop ring **245** at an axial end merges into the central part of the stop bar **230**. Owing to the fact that the stop ring **245** and the central part of the stop bar **230** have the same external diameter, the second stop ring **245** in this case merges seamlessly into the remainder of the stop bar **230**. At a second axial end the second stop ring **245** is bounded by a part **246** of the stop bar **230** with a reduced diameter. The part **246** with reduced diameter can also be regarded as a circular opening or groove **246** in the surface of the stop bar **230**. The blocking faces **245** of the sliding lug **222**, the first blocking ball **226** and second blocking ball **227** and the first stop ring **235** and second stop ring **245** are part of a blocking device **249**.

In the use position of FIG. **22**, in other words the position in which the plug **200** is suitable for power points of the British type, the second set of pins **212** is blocked in a certain way. The blocking faces **225** are resting upon the blocking ball **227**, which in turn can transmit an axial force to the sliding tube **220**, and therefore to the housing **201**. The blocking ball **227** is locked in the blocked use position, or is stopped by the second stop ring **245**. The blocking ball **227** consequently cannot move in the radial direction.

By pressing the push button **213** against the spring force of coil spring **232**, the second stop ring **245** is made to move away from the second blocking ball **227**. The fact that the first stop ring **235** and second stop ring **245** are connected to each other by the stop bar **32** means that at the same time the first stop ring **235** moves away from the first blocking ball **227**. However, this is not important in the position shown in FIGS. **22** and **23**. The axial movement away from the second stop ring **245** causes the second circular opening **246** of the stop bar **230** to reach the position of the second blocking ball **227** (FIGS. **24**, **25**). Simultaneously exerting force in the axial direction upon the double-sided sliding element **211**, for example by way of the second set of pins **212**, will cause the slanting blocking face **225** to push the second blocking ball **227** into the second circular opening **246**.

This gives rise to the situation shown in FIG. **25**. In this release position of the second stop ring **245** the blocking action between the blocking faces **225** and the blocking ball **227** is removed. The situation shown in FIGS. **26** and **27** is produced by then pushing the sliding element **211** on further and releasing the push button **213**. The double-sided sliding element **211**, and consequently the first set of pins **210**, is now blocked in the axial direction by way of blocking face **225** of sliding lug **222** and first blocking ball **226**, which itself rests upon the sliding tube **220**. The first blocking ball **226** is not movable in the radial direction, owing to the presence of the first stop ring **235**.

If the push button **213** is pressed again, in the situation of FIG. **27** a situation broadly corresponding to that of FIG. **25** will arise. The first circular opening **236** will go to the position of the first blocking ball **226**, making the latter movable in the radial direction, so that the blocking effect between the first blocking ball **226** and the blocking face **225** is removed.

FIGS. **28-31** show a plug **300** according to a third embodiment of the invention. The plug **300** is intended for use as a mains plug, for earthed applications. The plug **300** comprises a housing **301** with a first contact face **302**. The housing **301** is furthermore provided with a power cable **303** and a cover **304** for a fuse. The housing **301** furthermore comprises a second contact face **305**, which is provided substantially diametrically opposite the first contact face **302**.

The shape and dimensions of the first contact face **302** correspond to those of an earthed power point of a first type, in this case of the type usually found in China. The shape and dimensions of the second contact face **305** correspond to those of power points of a second type, in this case of the type usually found in the British Isles, Ireland and Hong Kong.

The plug **300** is provided with a first set of pins **310**, which is suitable for use in the first type of power point. The first set of pins **310** is provided on a double-sided sliding element (not shown). The sliding element is slidably accommodated in the housing **301**, so that it can assume a first position (FIGS. **28** and **29**) and a second position (FIGS. **30** and **31**) as desired.

The plug **300** furthermore comprises a second set of pins **312** and a push button **313**. The push button **313** is recessed in the second contact face **305**.

The first set of pins **310** and the second set of pins **312** are provided on first and second pin faces (not shown) respectively of the sliding element.

The sliding element **311** and the housing **301** are provided with blocking means (not shown). Furthermore, the plug **301** is provided with a stop bar (not shown), one end of which acts as the push button **313**. The design and functioning of the blocking means and the stop bar can be comparable to those of the second embodiment, as shown in FIGS. **22-27**. However, it is pointed out that instead of blocking balls, as shown by reference numerals **226** and **227** of FIGS. **22-27**, it is also possible to use blocking lips, as shown and described in relation to the first embodiment, or a differently designed stopper which is movable between a stop position, in which the mutual movability of the blocking means is prevented, and a release position.

FIGS. **32-35** show a plug **400** according to a fourth embodiment of the invention. The plug **400** is intended for use as a mains plug, for non-earthed applications. The plug **400** comprises a housing **401** with a first contact face **402**. The housing **401** is furthermore provided with a power cable **403**. The housing **401** furthermore comprises a second contact face **405**, which is provided substantially diametrically opposite the first contact face **402**. The shape and dimensions of the first contact face **402** correspond to those of an non-earthed power point of a first type, in that case of the type usually found on the continent of Europe. The shape and dimensions of the second contact face **405** correspond to those of power points of a second type, in that case of the type usually found, for example, in the British Isles, including Ireland and Hong Kong.

The plug **400** is provided with a first set of pins **410** (FIG. **33**), which is suitable for use in the first type of power point. The first set of pins **410** is provided on a double-sided sliding element (not shown). The sliding element is slidably accommodated in the housing **401**, so that it can assume a first position (FIGS. **32** and **33**) and a second position (FIGS. **34** and **35**) as desired.

The plug furthermore comprises a second set of pins **412** (FIG. **34**) and a push button **413**. The push button **413** is recessed in the first contact face **402**.

The second set of pins **412** comprises two live pins **460** and an opener **462**. Since the plug **400** in the exemplary embodiment shown is provided for non-earthed power points, the opener **462** serves to unblock the power point concerned. The first set of pins **410** and the live pins **460** of the second set of pins **412** extend from respective pin faces (not shown) of the sliding element. The opener **462** in this exemplary embodiment is connected to the housing **401** in such a way that it is rotatable about an axis of rotation (not shown). Otherwise, in a variant on this fourth embodiment the opener **462** can also be connected to the sliding element, as shown in the second and third embodiments, or it could be permanently connected to the housing **401**, in order to act as a sliding element, as shown in the first embodiment.

Blocking means and a stopper are accommodated in the housing **401**, which stopper is connected to the push button **413**. The blocking means and stopper are designed in a comparable manner to that shown in detail in relation to the first and/or second embodiment.

Electronics are also accommodated in the housing **401** of the plug **400**, for transforming and/or rectifying an electric current which is introduced into the housing **402** by way of the first set of pins **410** or second set of pins **412**. The electronics can furthermore comprise a control system for switching and/or metering a desired quantity of current, for example with a view to charging an electrical consumer appliance that has a battery. Examples of such electrical consumer appliances are mobile telephones, shavers, portable computers (hand-held or otherwise), navigation systems, portable audio equipment, video cameras, still cameras, and electrical equipment.

The electronics could also be suitable for directly charging a set of exchangeable, rechargeable batteries. The holder for accommodating the rechargeable batteries can be integral with the housing **401** of the plug **400**, or it can be connected to said housing by means of the power cable **403**.

In the case of direct charging of electrical appliances, the power cable **403** will generally end in a female-type plug, which can be connected to the electrical appliance concerned. Depending on the application concerned, the electronics do not necessarily have to comprise a control system for metering the charging current. Nor is it necessary in all cases to rectify the transformed current.

Within the scope of the invention a number of variants are possible for the parts shown. For instance, a plug with only one set of pins is possible, for a simple plug whose pins are telescopic. It is also possible for the plug to be provided with more than two sets of pins.

Furthermore, types of plugs other than mains plugs can be provided with pins with a blocking device according to the invention. Although the embodiments illustrated are in the form of a plug with a power cable, it is also possible to design the invention in the form of an adapter or travel plug. In that case one face of the housing is provided with plug-receiving means, or a power point for one or more types of plugs. Of course, electronics for transforming and/or rectifying current, such as described here in relation to the fourth embodiment, can also be present in differently designed plugs according to the invention. Other combinations of pins, and pins that are suitable for countries other than those described, are also possible.

Other blocking means are conceivable in addition to the blocking means shown, in the form of bevelled faces, blocking lips and blocking balls. It is pointed out here that the bevelled faces are bevelled in order to facilitate the movement of the blocking means away from each other when the stopper is in the release position. It is, however, also conceivable for the blocking means in the release position to move away from each other in another manner, for example by means of spring means. In that case the blocking faces need not be bevelled, and they can extend, for example, substantially in the radial direction.

The stoppers shown are for the most part integral with the stop bar in which they are provided. However, a stopper can also be provided in the form of, for example, a separate ring, or separate lugs, which are provided on a stop element. If several stoppers are provided in a blocking device, as illustrated, they need not be provided on the same stop element and thus be operable by means of one stop element and push button. The stoppers can also be located on individual elements and operated individually if desired.

One or more sets of pins can be movably connected to the housing in a way other than being slidably connected. For instance, it is conceivable for the set of pins to swing rotatably out of the housing.

The invention thus provides a plug with a set of slidable pins and a blocking device. The blocking device comprises a stopper which ensures greater reliability and is not so susceptible to wear. The plug can also be produced in a simple manner, with a relatively small number of parts. The necessary parts for the blocking device take up little space in the housing, owing to the fact that they extend partly in the sliding direction of the pins. The blocking of the pins which are pushed out into the active position and the pins which are in the housing can be performed partly by means of the same

blocking device. This means that fewer different parts are required than is the case in the prior art.

What is claimed is:

**1**. A plug, comprising:

a housing with a first contact face,

a first set of pins for a first type of power point, and

a first blocking device, comprising interacting first and second blocking means, in which the first set of pins is slidably accommodated in the housing so as to assume an active or a passive position as desired, the first set of pins in the active position projecting from the first contact face of the housing in such a way that said set of pins can be inserted into the first type of power point,

the first blocking means are connected to the first set of pins,

the second blocking means are connected to the housing, and

the first and second blocking means are movable relative to each other, so that they can assume a blocking position, in which the slidability of the first set of pins is blocked, and an unblocking position, in which the first set of pins is slidable,

wherein the first blocking device furthermore comprises a first stopper, which first stopper is movable relative to the first and second blocking means between a stop position, in which the first stopper inhibits the movability of the first and second blocking means relative to each other, and a release position in which the first stopper does not inhibit the movability of the first and second blocking means relative to each other.

**2**. The plug according to claim **1**, in which the first stopper is movable in a sliding direction of the first set of pins.

**3**. The plug according to claim **1**, in which the second blocking means are intended to interact with the first blocking means to block the slidability of the first set of pins in the active position and

the first blocking device furthermore comprises third blocking means connected to the housing, for interacting with the first blocking means to block the slidability of the first set of pins in the passive position.

**4**. The plug according to claim **3**, in which the first blocking device furthermore comprises a second stopper, which second stopper is movable between a stop position, in which the movability of the first and third blocking means relative to each other is prevented, and a release position.

**5**. The plug according to claim **4**, in which the first and second stoppers are permanently connected to each other.

**6**. The plug according to claim **1**, furthermore comprising a second set of pins for a second type of plug.

**7**. The plug according to claim **6**, furthermore comprising a double-sided sliding element, slidably accommodated in the housing, so that it can assume a first and a second position as desired,

which double-sided sliding element comprises first pin faces and second pin faces, in which

the second pin face is provided substantially diametrically opposite the first pin face,

the first set of pins extends from the first pin face, and the second set of pins extends from the second pin face,

the first set of pins in the first position projects from the first contact face of the housing in such a way that it can be inserted into the first type of power point, and

the second set of pins in the second position projects from a second contact face of the housing in such a way that it can be inserted into the second type of power point.

**8**. The plug according to claim **6**, in which the second set of pins comprises at least three pins, one of which pins is an opener for a fused power point, such as a British power point, and

the first set of pins is provided on a sliding element which is provided so as to be slidable around the opener of the second set of pins.

**9**. The plug according to claim **8**, in which the first blocking means are provided on the sliding element, the second blocking means are provided on the opener, the opener is permanently connected to the housing, and the stopper is provided in the opener.

**10**. The plug according to claim **6**, furthermore comprising a second blocking device, which comprises interacting fourth blocking means and fifth blocking means, in which

the second set of pins is slidably accommodated in the housing so as to assume an active or a passive position as desired, the second set of pins in the active position projecting from the housing in such a way that it can be inserted into the second type of power point,

the fourth blocking means are connected to the second set of pins,

the fifth blocking means are connected to the housing, and

the fourth and fifth blocking means are movable relative to each other, so that they can assume a blocking position, in which the slidability of the second set of pins is blocked, and an unblocking position, in which the second set of pins is slidable, and in which

the second blocking device furthermore comprises a third stopper, which third stopper is movable between a stop position, in which the movability of the fourth and fifth blocking means relative to each other is prevented, and a release position.

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